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MINING AND METALLURGY

Bulletin 179 Law Serial 18

DEPARTMENT OF THE INTERIOR
FRANKLIN K. LANE, SECRETARY
BUREAU OF MINES
VAN. H. MANNING, DIRECTOR

ABSTRACTS OF CURRENT DECISIONS
ON
MINES AND MINING

REPORTED FROM
SEPTEMBER TO DECEMBER, 1918

BY

J. W. THOMPSON

WASHINGTON
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PREFACE.

This bulletin, one of a series published by the Bureau of Mines, contains abstracts of all mining cases of all the highest courts reported in 1918, from September to December, inclusive. The references are to the full reported cases as decided by all the courts relating to various phases of mining enterprise.

In issuing these bulletins the bureau aims to present abstracts of decisions and references within a reasonable time after the cases have been decided. It is the hope of the bureau that the bulletins will be of value to mine owners, operators, and miners. A limited edition of each bulletin is printed for free distribution. When this edition is exhausted, copies may be purchased from the Superintendent of Documents, Washington, D. C.

VAN. H. MANNING,
Director.

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ABSTRACTS OF CURRENT DECISIONS ON MINES AND MINING, SEPTEMBER-DECEMBER, 1918.

By J. W. Thompson.

MINERALS AND MINERAL LANDS.

MINERALS.

MINERALS IN SITU—INTEREST IN LAND.

The title to minerals in situ constitutes an interest in land.

Colby, In re, —— Iowa ——, 169 Northwestern 443, p. 444.

ESTATE IN MINERALS.

Minerals beneath the surface may be made the subject of separate ownership either by a grant of the minerals by the owner of the land or by a grant of the land excepting the minerals, and thereby an estate in fee simple is created in the minerals, as corporeal things real.

Colby, In re, —— Iowa ——, 169 Northwestern 443, p. 444.

DEEDS EXCHANGING DIFFERENT MINERALS—RIGHTS OF PARTIES.

The lands of two adjoining owners were underlaid with cement rock and clay at a depth of about 100 feet from the surface and with coal veins some 600 feet below the surface. By an exchange of deeds one of the land owners conveyed to the other the cement rock and clay with the right to mine and remove the same without entering upon the surface, but the deed contained no covenant not to injure the surface. The other deed conveyed the coal seam and so much of the rock and other minerals just above and below the coal as might be required in connection with the mining and removing of the coal, together with the right to mine and remove the same, and the adjacent rock, clay, and other minerals, without entering upon or injuring the surface, with one immaterial exception. The deeds do not define the word "surface" and neither expressly nor by implication did they secure to the coal owner the right to subside the overlying cement rock; but the implication is to the contrary, as the deed gives the right to mine and remove coal without entering upon or injuring the surface. The provision that the coal owner should not enter upon or injure the surface amounts to a clause that the coal mine shall not be worked so as to let down the surface and this does not create any inconsistency with the provision giving the right to mine and carry away the coal.

Marquette Cement Min. Co. v. Oglesby Coal Co., 253 Federal 107, p. 110.

TITLE TO SEVERED MINERALS.

The owner of the coal underlying the surface, where there has been a severance of the surface and the minerals, does not lose his right or his possession by any length of nonusage; but to lose such right he must be disseised and there can be no disseisin by any act which does not actually take the coal out of his possession.

Vance v. Clark, 252 Federal 495, p. 498.

POSSESSION OF SEVERED MINERALS—PROOF TO SUSTAIN TITLE.

Where there has been a severance of the surface and the minerals it is incumbent upon a person in possession, who seeks to acquire title to the minerals by possession, to show such possession of minerals as is required to gain title to the surface by occupancy for a statutory period.

Vance v. Clark, 252 Federal 495, p. 498.

CONVEYANCE OF SEPARATE STRATA—RIGHT OF OWNER OF HIGHER STRATUM.

One land owner conveyed to an adjoining owner a ledge of cement rock and clay lying about 100 feet below the surface. The grantee in this conveyance conveyed to the grantor the seam of coal in his land lying some 500 feet below the cement rock conveyed by the first deed. In the absence of provisions and conditions in the deed to the contrary the owner of the higher stratum is entitled to the same rights as an actual surface owner and the right of support is vital to the owner of the overlying strata.

Marquette Cement Min. Co. v. Oglesby Coal Co., 253 Federal 107, p. 110.

OIL AND GAS AS MINERALS—OWNERSHIP.

Oil and gas are minerals and so long as they are in place they belong to the owner of the land under which they lie and he has the right to explore for them and extract them. However, if they escape from his premises to the premises of another before he has captured them, they are no longer his property; but on the other hand if by exploration on his premises oil escapes therefrom to the premises of an adjoining owner it becomes his property.

Pittsburgh & West Virginia Gas Co. v. Ankron, —— W. Va. ——, 97 Southeastern 593, p. 594.

See Warren v. Boggs, —— W. Va. ——, 97 Southeastern 589, p. 592.

TRANSPORTATION OF MINERALS—INVALID FREIGHT RATE.

The Legislature of North Dakota by statute fixed a freight rate for the transportation of coal. This rate was held valid by the supreme court of that State, but on appeal the United States Supreme Court finally held the rate to be confiscatory. In the meantime a railroad company, as a common carrier, had hauled and transported for a coal company a large amount of coal at the specified statutory rate. It does not follow from the fact that the statutory rate was confiscatory that the shipper is obliged as a matter of law to make reparation to the carrier.

Minneapolis, etc., R. Co. v. Washburn Lignite Coal Co., —— N. Dak. ——, 168 Northwestern 684, p. 686.

MINERAL LANDS—SALE AND CONVEYANCE.

ACCEPTANCE OF DEED BY GRANTEE—ESTOPPEL.

The grantees in a deed conveying mineral lands, or conveying lands reserving the mineral rights, who accepted the deed and held the land under it, are estopped from alleging its invalidity on the ground that the attorney in fact who executed it exceeded his authority.

Midkiff v. Colton, 252 Federal 420, p. 423.

DEED RESERVING MINERALS—PRESUMPTION AS TO ACCEPTANCE.

Prior to the execution of a deed conveying the surface of certain lands to the grantees named and reserving the mineral rights to the grantor, the grantees had been adjudged to have no interest whatever in the land. The fact that the deed conferred certain benefits upon the grantees and was subsequently found in the possession of one of them raises a strong presumption of the acceptance of the deed. This presumption may be reinforced by parol proof of statements of the grantees as to their interest acquired by the deed and that subsequent conveyances were made by them.

Midkiff v. Colton, 252 Federal 420, p. 423.

DEED RESERVING MINERALS—ACCEPTANCE—ESTOPPEL.

A grantee having no title to certain lands but who had received a deed of conveyance from the true owner at the time it was made, and had carefully preserved the deed and produced it from his possession, can not be allowed to defeat the conveyance by testifying that he never accepted the deed and that he has been holding adversely to it.

Midkiff v. Colton, 252 Federal 420, p. 423.

CONVEYANCE BY FORGED DEED—UTTERANCE.

The fact that a grantee named in a deed purporting to convey land to himself, and that he knew it to be forged, and upon the faith of its authenticity sold and conveyed to a third person the minerals and coal in the land, is sufficient evidence of the utterance of the forged deed.

Daniels v. Commonwealth, — Ky. ——, 205 Southwestern 402, p. 403.

CONTRACT OF SALE—OPTION.

By the terms of a contract the owners of mineral lands covenanted, promised, and agreed to grant, bargain, and sell the described land in consideration of certain sums to be paid upon the dates specified. The contract itself recited that if the option was not taken up, then all the machinery and fixtures should remain and become a part of the premises. The contract is clearly an option contract and not a sale, and the holder is not a vendee, but merely the holder of an option.

Smith v. Beebe, — Idaho —, 174 Pacific 608, p. 610.
See Harper v. Independence Dev. Co., 13 Ariz. 176, 108 Pacific 701.

CONTRACT OF SALE—TIME AS OF THE ESSENCE.

In all agreements looking to the sale of mining property, time is of the essence. The rule is especially applicable to mining property because of its liability to sustain fluctuations in value.

Smith v. Beebe, — Idaho —, 174 Pacific 608, p. 610.

GUARANTY OF TITLE.

By the terms of a contract a certain milling company was to organize a new corporation and two mining companies agreed to convey to the new corporation, by a good and sufficient deed, "a satisfactory merchantable title free and clear from any and all liens, incumbrances and taxes of every name or nature whatsoever," to certain mines and mining property. A contract of guaranty was executed to secure the performance of the general contract and to save the obligors "in the event said titles are not found merchantable and good." The contract of guaranty, with reference to the title of the mining properties, was narrower or different from the contract of the mining companies, but a guaranty may be narrower than the principal contract to be secured, and its guaranty can not be enlarged beyond the strict intent of the instrument. The contract did not guarantee that the title or titles would be satisfactory, and if the conveyance passed a merchantable title to the property referred to, the terms of the contract and of the guaranty were satisfied.

Sutton, Steele, etc., Min. Co. v. McCulloch, — Colo. ——, 174 Pacific 303.

SURFACE AND MINERALS—OWNERSHIP AND SEVERANCE.

SEPARATION OF MINERALS AND SURFACE—PRESUMPTION.

The presumption that the owner of land having the possession of the surface has the possession of the subsoil or minerals underlying does not exist when there has been a severance of the surface and the minerals.

Vance v. Clark, 252 Federal 495, p. 498.

MEANING OF "SURFACE"—APPLICATION TO MINERAL STRATA.

The word "surface" in mining controversies means that part of the earth or geologic section lying over the minerals in question, unless otherwise defined by the deed or conveyance. It is not merely the top of the glacial drift, soil, or the agricultural surface. The owner of a higher stratum is entitled to the same rights as the actual surface owner.

Marquette Cement Min. Co. v. Oglesby Coal Co., 253 Federal 107, p. 111

POSSESSION OF SURFACE—EFFECT ON MINERAL RIGHTS.

Where the estates in the surface of land and the underlying minerals have been severed, the possession of the surface and improvement thereof are not inconsistent either with the title to the coal outstanding in another, or with the right of mining the same. Such possession does not extinguish the outstanding title to the mineral.

Preston County Coke Co. v. Elkins Coal & Coke Co., — W. Va. —, 96 Southeastern 973, p. 975.

POSSESSION OF SURFACE—ADVERSE POSSESSION OF MINERALS.

A purchaser of land who took his conveyance with knowledge that the surface had been severed from the minerals by a deed of the surface reserving the minerals can not subsequently claim the minerals by adverse possession because of his ownership and possession of the surface of the land.

Midkiff v. Colton, 252 Federal 420, p. 424.
See Vance v. Clark, 252 Federal 495.

POSSESSION OF SURFACE—RIGHTS TO SEVERED MINERALS.

The owner of the surface of land, when the underlying coal has been separately conveyed, can acquire no title to the coal by his exclusive and continued possession of the surface.

Vance v. Clark, 252 Federal 495, p. 498.

USE OF SURFACE—KNOWLEDGE OF OWNERS.

It is a matter of common knowledge that the surface of land can be advantageously used for many purposes in subordination to the exercise of reasonable and ordinary mining rights, and the owners of the surface and of the mining rights are presumed to have knowledge of these facts. With such presumption of knowledge the owner of the mining rights in certain land does not waive or release or otherwise burden his mining rights by releasing to a purchaser a mere option or privilege held by him to purchase the surface. But a purchaser who acquires the surface with such knowledge and accepts a deed expressly excepting the mining rights is bound thereby.

Preston County Coke Co. v. Elkins Coal & Coke Co., — W. Va. —, 96 Southeastern 973, p. 974.

USE OF SURFACE—INJUNCTION.

The owner of land conveyed the underlying coal with the free and uninterrupted right of way under the land at such points and in such manner as might be necessary and proper for the purpose of digging, mining, draining, ventilating, and carrying away the coal, and expressly waived all damages arising therefrom or from the removal of the coal, together with the privilege of mining and removing through the premises described other coal belonging to the grantee or his assigns. In the operation of a mine in the coal seam conveyed, gas was generated, and by reason of a part of the coal having been mined out and falls having resulted, the gas accumulated and settled in and over the seam of coal in dangerous quantities and in such places and manner that it could not be removed by the ordinary means of ventilation. Under these circumstances and for the purpose of removing the gas and for the proper ventilation of the mine, the mine operator had the right to enter upon the surface of the land and drill a bore hole 10 inches in diameter for the purpose of releasing the accumulation of gas in its mine; and the surface owner can not by injunction prevent the mine operator from exercising this right.

Oberly v. H. C. Frick Coke Co., — Pa. —, 104 Atlantic 864, p. 865.

USE OF SURFACE—LIMITATION—GRANTEE NOT ESTOPPED TO COMPLAIN.

The owner of mineral lands conveyed the surface by deed, reciting that the party of the first part shall continue the owner of the minerals with the right to mine and extract the same: "Provided, that in the exercise of such mining rights, said premises shall not be disturbed, damaged, or interfered with by said party of the first part." The grantor thus voluntarily limited his right to such mining operations as would not disturb, damage, or interfere with the grantee in the use and occupation of the surface ground. Under such a reservation the grantee was not estopped from enjoining such mining operations that constituted a nuisance under the Montana statute.

Cavanaugh v. Corbin Copper Co., — Mont. —, 174 Pacific 184, p. 186.

RELEASE OF RIGHT TO PURCHASE SURFACE—EFFECT ON MINING RIGHTS.

The coal and mining rights in certain land were conveyed by deed with the right to take at any time as much of the surface of the tract of land as might be necessary for the operation of the coal or manufacturing coke, at a certain stated price. Later the coal grantee released to a subsequent purchaser of the surface the option to purchase the surface. The release of this privilege or option to purchase to one who purchased the surface subject to the mining rights and with knowledge of the intention of the owner of the mining rights to devote the surface to certain uses in connection with his mining right is not necessarily a preclusion of the exercise of the mining rights, especially where the conveyance to the surface owner expressly excepted the mining rights.

Preston County Coke Co. v. Elkins Coal & Coke Co., — W. Va. —, 96 Southeastern 973, p. 974.

CONVEYANCE OF MINERALS WITH PRIVILEGE OF REMOVAL—EFFECT.

A conveyance of the underlying coal with the privilege of its removal from under the land of the grantor, particularly described, effects a severance of the right to the surface and the right to such underlying coal and makes them distinct corporeal hereditaments.

Vance v. Clark, 252 Federal 495, p. 498.

CONVEYANCE OF MINERALS—RIGHT TO MINE.

When a landowner grants the underlying minerals, reserving the surface to himself, his grantee is entitled only to so much of the mineral as he can get without injury to the superincumbent soil.

Marquette Cement Min. Co. v. Oglesby Coal Co., 253 Federal 107, p. 115.

See Wilms v. Jess, 94 Ill. 464, 34 Am. Dec. 242; Lloyd v. Catlin Coal Co., 210 Ill. 460, 71 N. E. 335; Coleman v. Chadwick, 8 Pa. St. 81, 21 Am. St. Rep. 93; Horner v. Watson, 79 Pa. St. 242, p. 251, 21 Am. St. Rep. 550; Jones v. Wagner, 66 Pa. St. 429, 5 Am. St. Rep. 385; Zinc Co. v. Franklinite Co., 13 N. J. Chancery 342; Harris v. Ryding, 5 Meeson & Wellsby 59; Smart v. Morton, 5 Ellis & Blackburn 30.

CONVEYANCE AND RESERVATION OF MINERALS—RIGHT TO MINE—CONSTRUCTION OF DEEDS.

The owners of mineral lands arranged to transfer one stratum of minerals to one and another stratum of minerals to the other by cross conveyances, each conveyance making the proper reservation and granting the right to mine and remove the minerals so conveyed. In a controversy arising on the right to mine and remove the coal conveyed to one and in the construction of the deeds, evidence of all the surrounding circumstances was properly admitted to show the situation and relation of the parties and what they sought to materially accomplish by the deeds.

Marquette Cement Min. Co. v. Oglesby Coal Co., 253 Federal 107, p. 111.

RIGHT TO MINE—IMPLIED INCIDENTS OF GRANT.

A grant of minerals with a reservation of the surface gives the right to enter and to mine and remove the minerals, unless the language of the grant itself provides otherwise or repels this construction. This right is so inseparable from a grant of minerals that not only is it necessarily an implied incident thereto, but it and its derived rights can not be restrained or excluded by a special affirmative power to do other acts, or by a grant of other privileges necessary or convenient to the working of mines. The right to work a mine involves the right to penetrate the surface of the soil for the minerals, to remove them in the manner most advantageous to the mine owner, and to use such means and processes in mining and removing the minerals as may be necessary in the light of modern mining improvements.

Oberly v. H. C. Frick Coke Co., —— Pa. ——, 104 Atlantic 864, p. 865.

MINING RIGHTS—TERM OF EXISTENCE.

As long as there is title to the underlying coal separate and distinct from the title to the surface, the right of mining and removing the coal must necessarily exist; and mining rights and privileges granted with the coal, being appurtenant thereto, must likewise exist in some form and to some extent as long as the title to the coal remains valid.

Preston County Coke Co. v. Elkins Coal & Coke Co., —— W. Va. ——, 96 Southeastern 973, p. 975.

CONVEYANCE OR RESERVATION OF MINERALS—EXPRESS AND IMPLIED RIGHTS—EASEMENT.

Usually on the severance of the surface and the underlying minerals the privileges that are impliedly incident to the right to mine are expressly granted or reserved in the instrument creating the mineral estate; but the character and extent of the implied rights are not altered if they are not in fact expressed. There may be expressed privileges added which would not otherwise be implied but if so these rights do not create an estate in the surface, but are easements to do certain acts thereon.

Oberly v. H. C. Frick Coke Co., —— Pa. ——, 104 Atlantic 864, p. 865.

SEPARATION OF MINERALS AND SURFACE—TIMBER FOR MINING PURPOSES—DUTY TO PROTECT.

A deed of mineral lands conferred upon the grantee the right to cut and use for mining purposes the timber on the surface. Under such a deed the timber remains the property of the grantor until the grantee exercises his right to take and use it for mining purposes pursuant to the deed; but until so cut and appropriated, the grantee owes the duty to use due and reasonable care not to damage the timber. This duty is the same as that owing by him to protect the surface.

Godfrey v. Weyanoke Coal & Coke Co., —— W. Va. ——, 97 Southeastern 186, p. 199.
See Raleigh Coal & Coke Co. v. Mankin, —— W. Va. ——, 97 Southeastern 299.

COAL AND COAL LANDS.

GRANT OF RIGHT TO MINE—INJURY TO SURFACE—LIABILITY.

A grant by a landowner conveyed the underlying coal with the right to mine and remove the same without reservation, let or hinderance, and with all proper and reasonable rights and privileges for ventilating and draining and without being in any way liable for any damage or injury which may be done to the land or to any water or watercourse therein or thereon by reason of mining, excavating, and removing the coal. The intention of the parties to this conveyance was to preclude the possibility of an attempt to hold the grantee or his assigns responsible in damages for injuries to the land by reason of any act done in the exercise of the rights conferred by the grant. Under such a grant, an action for damages for injuries resulting from the subsidence of the surface, because the mine operator failed to leave sufficient coal or pillars to support the surface, can not be maintained.

Godfrey v. Weyanoke Coal & Coke Co., —— W. Va. ——, 97 Southeastern 186, p. 187.

RIGHT TO MINE—FAILURE TO EXERCISE RIGHT.

The failure of the owner of coal to exercise his rights for a long period of time after the execution of a release of an option or privilege to purchase the surface, and after the improvement of the surface, will not amount to a practical construction of the release as against such right, nor will it extinguish the right under the law of estoppel.

Preston County Coke Co. v. Elkins Coal & Coke Co., —— W. Va. ——, 96 Southeastern 973, p. 975.

GRANT OF MINING RIGHTS—USE OF WAYS AND OPENINGS.

The owner of lands granted the underlying coal with the free and uninterrupted right of way into, under, and over the described tract of land at such points and in such manner for such ways, tracks, and roads as might be necessary and proper for the purposes of ventilating, draining, and mining the coal. The grantee can not under such a grant consistently be limited to an underground approach to any part of the coal, if there is reasonable necessity for a different way. In the mining operations the coal owner has a right to more than one opening and way and may find it to his advantage to operate two openings at the same time. Reasonable necessity for his purposes, the mining and marketing of the coal, is the true test, although the means adopted by him may be subject to reasonable limitation by the conditions he finds on the servient estate.

Preston County Coke Co. v. Elkins Coal & Coke Co., —— W. Va. ——, 96 Southeastern 973, p. 976.

DUTY OF OWNER TO KNOW BOUNDARIES—LIABILITY FOR MINING OVER LINE—DAMAGES.

Under a charge of trespass in mining coal the owner of adjoining coal lands is held to know the boundary between him and his adjoining owner. If he makes a mistake prima facie as to his title or boundaries in mining coal the least measure of damages applicable is the value of the coal immediately upon its conversion into a chattel without abatement of the cost of severance. But if the trespass has been committed through negligence or design then punitive damages in addition may be recovered.

Mt. Savage George's Creek Coal Co. v. Monahan, —— Md. ——, 104 Atlantic 480, p. 484.

MINING RIGHTS IN SURFACE—ESTOPPEL.

Mining rights in the surface are appurtenant to the underlying coal and these rights may be restricted or narrowed to some extent under principles and rules of interpretation of the law of estoppel by the condition in which the surface is found in consequence of improvements at the date of the exercise thereof; but such rights can not be deemed to have been extinguished by the mere use and improvement of the surface with the knowledge of the owner of such mining rights, nor by his nonuser thereof.

Preston County Coke Co. v. Elkins Coal & Coke Co., —— W. Va. ——, 96 Southeastern 973, p. 975.

POSSESSION OF SURFACE—OWNERSHIP OF COAL—ADVERSE POSSESSION.

The surface and the underlying coal of certain lands had been severed by a conveyance of the surface and a reservation of the coal. The owner of the surface through a long period of time took from existing openings of the veins of coal, coal for his own domestic purposes and occasionally permitted neighbors to so take, and in other instances himself digging the coal from such openings and selling it to his neighbors for domestic purposes. Such acts, though continued for a long period of time, do not constitute adverse possession of the coal. The possession of the surface with the mere incidental use of the coal such as any person occupying the surface might from time to time be tempted to make and might make as a mere incident to the use of the surface would not give adverse possession to the coal. For possession of coal to be adverse it must be used in an enterprise different and distinct from the use of the surface, and use of the coal merely incidental to the possession of the surface is not sufficient.

Vance v. Clark, 252 Federal 495, p. 498.

RESERVATION OF COAL—EFFECT AND EXTENT.

A deed conveying certain described land contained a provision as follows: "Except any timber and coal upon said land that the party of the first part may want to use during his lifetime." The exception shows that the use referred to should last no longer than the grantor's lifetime. Only such coal and timber were excepted from the conveyance as the grantor might want for his personal use during his lifetime and not such coal and timber as he might desire to sell to others. Only a personal use by the grantor during his lifetime was contemplated, and not a saleable use that would continue in effect after his death. A sale of timber or coal by the grantor after the conveyance would give no title to the purchaser.

Bates v. Gayheart, —— Ky. ——, 205 Southwestern 559, p. 560.

RESERVATION OF COAL FOR USE OF GRANTOR—CONSTRUCTION AND EXTENT.

A land owner by deed granted the right to mine and remove the entire amount and body of the underlying coal without reservation, let, or hindrance, but reserved to himself so long as he should choose to exercise it, the right to take coal from any bank on the land conveyed for his own fuel, the reservation being subject to the superior right of the grantee to mine and extract the coal until exhausted. The right reserved to take and use was subject to the superior right of the grantee to mine and remove the entire body of the coal. This particular reservation made by the grantor must necessarily terminate with the exhaustion of the coal mined and the coal-mine operator is under no duty or obligation to leave unmined a body of coal in the land for the use and benefit of the grantor or his assigns.

Godfrey v. Weyanoke Coal & Coke Co., —— W. Va. ——, 97 Southeastern 186, p. 188.

EJECTMENT—RIGHT TO CREDIT FOR IMPROVEMENTS.

In an action of ejectment for the possession of coal lands where there was a real contest as to the title of such lands and the possession was awarded the complainant, the defendant was not entitled to any credit by way of improvements for a railroad track, where the railroad was built on a right of way conveyed to it and the railroad was not in fact constructed by the defendant.

Staub v. Sewanee Coal, Coke & Land Co., —— Tenn. ——, 205 Southwestern 320 p. 322.

TRANSPORTATION OF COAL—CONFISCATORY RATES—RECOVERY FOR EXCESSIVE FREIGHT.

The Legislature of North Dakota fixed by statute a maximum rate for the transportation of lignite coal. The carriers of the State refused to carry coal because of the alleged confiscatory rate. The supreme court of that State approved the statutory rate but on appeal, the United States Supreme Court held that the rate was confiscatory. In an action by a railroad company to recover from a coal-mining company the difference between the confiscatory rate it was compelled to accept, while the law was held valid by the State supreme court, and the reasonable rate of transportation it was entitled to charge after the United States Supreme Court held the statutory rate to be confiscatory, the cause of action and the right to recover is held to be upon a contract implied either in fact or in law. The complaint in such an action must state facts from which the legal conclusion of liability on the part of the shipper follows; but an allegation that the coal was shipped by the complainant for the defendant under the statutory rate is only a legal conclusion. The facts stated must bring the complainant within the operation of some rule of substantive law according to which a liability may be found to exist and must be sufficient on which to base a finding that the defendant was indebted to the complainant under an obligation in the nature of a contract. The facts pleaded lead to the conclusion that there was no contract in fact, either express or implied, to pay any rate other than the statutory rate as filed and published by the railroad company.

Minneapolis, etc., R. Co. v. Washburn Lignite Coal Co., —— N. Dak. ——, 168 Northwestern 684.

OIL AND OIL LANDS.

OIL AS PERSONAL PROPERTY—PRODUCTION.

Oil in place is a part of the land in which it is found or from which it is obtained, but when brought to the surface and reduced to possession, it ceases to be real estate and becomes personal property, and as such, may be subject to partition among its joint owners.

Warren v. Boggs, —— W. Va. ——, 97 Southeastern 589, p. 592.

GRANT OF OIL ROYALTIES—EFFECT.

A deed by the owners of land covered by an oil and gas lease conveyed to the grantee all the royalty interest in the oil. Such a deed has the same effect as a grant of the oil itself.

Snodgrass v. Koen, —— W. Va. ——, 96 Southeastern 606, p. 608.

OIL OPERATIONS—JUDICIAL NOTICE.

The courts take judicial notice of the fact that oil and natural gas are mined by means of deep wells drilled into the earth.

Kemp v. Barr Gas Co., —— Kans. ——, 175 Pacific 988, p. 989.

CONVEYANCE OF OIL AND GAS—FEE SIMPLE TITLE.

The owners of land on which existed an oil and gas lease by deed granted to a third person all the royalty interest in the oil and rentals for gas wells and in addition conferred upon the grantee exclusive authority to drill for oil and gas after the termination of the existing lease, without restriction or limitation upon the exercise of such right. Such deed vested in the grantee the fee simple title to the oil and gas in place in the land.

Snodgrass v. Koen, —— W. Va. ——, 96 Southeastern 606, p. 608.

GRANT OF RIGHT TO PROSPECT FOR OIL AND GAS—RIGHT OF LAND OWNER.

The statute of Texas (General Laws 33d Leg., Vernon Sayle's Ann. Civ. Stats. 1914, sec. 5920g), provides that the issuance of a permit or lease to prospect for oil or the filing of the prospector's affidavit on unsold land shall not prevent the sale of the land, but if sold after an application, the purchaser shall not be entitled to any part of the proceeds of any mineral or mining location, nor other compensation, nor shall he have any action for damages done to the land resulting from the proper working or operation under the mining permit. Under this statute where the complainant's right to land was forfeited for nonpayment of interest in 1914 and reawarded to him in 1916, he had no title to the land within the meaning of this statute where the applications were made prior to 1916.

South West Texas Oil & Gas Co. v. Boykin, —— Tex. Civ. App. ——, 206 Southwestern 216, p. 217.

SALE OF LEASE—RIGHTS OF LAND OWNER.

A lessor of an oil and gas lease that prohibited the transfer without his consent, can not maintain an action for damages for his aliquot part of a total consideration received by the lessee for the particular lease and for several other leases all sold for a bulk consideration.

Moherman v. Anthony, —— Kans. ——, 175 Pacific 676.

SEPARATION OF OIL AND GAS RIGHTS—INJUNCTION.

A land owner executed an oil and gas lease upon his land to certain named lessees. The lessees by a contract between themselves separated the gas and oil rights, one taking the gas and the other the oil.

Under such an agreement, the owner of the gas rights can not enjoin the owner of the oil rights from operating an oil well in violation of the rights of the land owner, the original lessor.

Arnold v. Garnett Light & Fuel Co., —— Kans. ——, 174 Pacific 1027, p. 10128.

INJUNCTION TO PREVENT TRESPASS AND WASTE.

Courts of equity generally refuse to interfere with the possession of land before the rights of the parties have been determined at law; but where the possession of a trespasser is not exclusive and is in fact only an interruption of the prior open, notorious, and peaceable possession of the complainant, an injunction may be allowed, especially where the entry by the defendant was for the purpose of committing waste in the taking and removing oil from the premises.

Collier v. Bartlett, —— Okla. ——, 175 Pacific 247, p. 250.

RECEIVERSHIP—PROTECTION FROM WASTE AND DESTRUCTION.

Under a charge of fraud in obtaining possession of oil lands, and pending proceedings upon an application for a patent and where the charges of fraud are under investigation, the Government is entitled to protection by a court of equity and by a receivership of the property involved to prevent waste and destruction pending the final determination of its rights in the Land Department.

Devil's Den Consolidated Oil Co. v. United States, 251 Federal 548, p. 554.

ADVERSE POSSESSION—TITLE OF MARRIED WOMAN.

A married woman, by gift or conveyance from a person in possession claiming title, acquired title by adverse possession, and this can not be affected by the acts of her husband. Under a title so acquired she or her devisee in possession after her death may execute a valid oil and gas lease granting rights prior and superior to an oil and gas lease of the land executed by the husband.

Big Blaine Oil & Gas Co. v. Yates, —— Ky. ——, 206 Southwestern 2, p. 4.

ENTRY UNDER GIFT—CLAIM OF TITLE—ADVERSE POSSESSION.

A husband and father purchased 50 acres of land, paying a part of the consideration and taking a title bond for a deed. Immediately after this purchase the husband and father disappeared from the community and did not return and made no further claim to the 50-acre tract or to other lands owned by him at the time of his departure. Shortly after his disappearance an adult son took possession of the 50-acre tract, claiming it as his own and claiming that his father purchased it for him. While so in possession he paid the balance due on the purchase price and under his claim of title occupied and improved the land. This son purchased the entire tract left by the father on foreclosure sale and obtained a deed therefor and conveyed part of it to the mother. Later this son "turned over" to the mother the 50-acre tract, who took possession of it and continued to occupy, use, and claim it until her death. She held and occupied the land for some 25 years and during that time executed two leases for the privilege of mining coal under the land and finally disposed of it by will to another son. Subsequently the devisee executed an oil and gas lease for the land. Two years after the mother's death the husband returned, claimed the 50-acre tract as his own and executed an oil and gas lease thereon. In a controversy between the lessees of the two leases, the lessee of the devisee was held to have the prior and superior right on the theory that the possession of the land by the son under a claim of gift and the continuous possession of the mother as the grantee or donee of the son was adverse to the title and right of the husband and father and that the title vested in the mother by virtue of her adverse possession.

Big Blaine Oil & Gas Co. v. Yates, —— Ky. ——, 206 Southwestern 2, p. 4.

PERMIT TO OPERATE OIL LANDS—SUBSEQUENT PURCHASER—RECOVERY FROM OIL PROSPECTOR.

An oil prospector on December 1, 1915, obtained a permit to operate certain lands for oil under the statute of Texas. The land at that time was owned by an applicant to purchase the same as public school lands. After the grant of the permit to prospect for oil the purchaser under the statute forfeited his interest in the land for the nonpayment of interest, but was given the right to repurchase after classification and reappraisement. After his repurchase he brought suit against the oil prospector for the statutory rent under the permit to operate for oil. The complainant at the time of the institution of the suit was not the owner of the land within the meaning of the statute of Texas giving to the land owner a rental of 20 cents per acre per annum from a permittee operating the land for oil.

South West Texas Oil & Gas Co. v. Boykin, —— Tex. Civ. App. ——, 206 Southwestern 216, v. 217.

NATURAL GAS.

NATURE AS COMMODITY AND FUEL.

Natural gas is a commodity as much so as coal, and like coal it is a fuel and as such is used for domestic and industrial purposes. It is a subject marketable, either within the State wherein it is produced or in a State to which it is transported and sold.

Suttle v. Hope Nat. Gas Co., —— W. Va. ——, 97 Southeastern 429, p. 31.

GRANT OF ROYALTIES—EFFECT.

A deed by the owner of land covered by an oil and gas lease conveyed to the grantee all the royalty interest in the natural gas. Such a deed has the same effect as a grant of the gas itself.

Snodgrass v. Koen, —— W. Va. ——, 96 Southeastern 606, p. 608.

SALE OF SURPLUS GAS—CONSTRUCTION AND MEANING.

A natural gas company having developed a quantity of gas in one district, and having large quantities of gas from other sources, sold to another company such gas from the first district as the seller did not desire for use to supply its own customers or for the drilling of wells and such as the purchasing company might wish to purchase. The sale was limited to the "surplus natural gas" from the particular district that the seller did not need for its own use. Under the contract the seller was not limited in the use of the gas from the particular district named and the fact that it had other supplies in no way restricts its right to use to any extent for itself or customers the gas in the district named. In any event the purchasing company could claim no more than the surplus gas remaining after whatever use the selling company chose to make of the gas produced in that district.

Elk Natural Gas Co., v. Ridgeway Light & Heat Co., —— Pa. ——, 104 Atlantic 546.

PURCHASE FOR GASOLINE PURPOSES—LIABILITY FOR DECREASED FLOW.

An oil company sold to another the right to take pipe, and utilize gas from its oil wells and manufacture gasoline therefrom on the leased premises. The purchaser was to furnish at his own expense the instrumentalities necessary and usual in the process of producing gasoline and to pay to the oil company a stipulated part of the profits derived from the business. The oil company used certain patented processes to accellerate oil production from the wells and thereby unfitted the gas escaping therefrom for use in the manufacture of gasoline and rendered the manufacture of gasoline unprofitable and compelled the purchaser of the gas to abandon the manufacture of gasoline at great loss and damage, for which he sued the oil company. The oil company by contracting for the sale of the gas to be manufactured into gasoline did not restrict its right to develop and exploit the oil field and did not by the contract debar itself from the use of such means for stimulating the flow of oil as science and experience have proved to be advantageous, and the oil company can not be held liable in damages for losses thus accruing to the purchaser of the gas for gasoline purposes.

Beeson v. Drake Oil Co., —— W. Va. ——, 97 Southeastern 414, p. 415.

WASTE PREVENTED—ACTION BY STATE.

The statute of Kansas (sec. 4970, General Statutes, 1915) makes it unlawful for any person to permit the flow of gas from a well to escape into the open air. The enforcement of this statute is a public duty and prosecutions under it must be in the name of the State. If property rights of an individual are injured by a violation of the statute an appropriate action will lie in favor of such individual. But one lessee under an oil and gas lease can not enjoin another lessee, where their rights under the lease had been separated by agreement, from permitting gas to escape from the well into the open air.

Arnold v. Garnett Light & Fuel Co., —— Kan. ——, 174 Pacific 1027, p. 1028.

JUDICIAL NOTICE OF OPERATIONS.

The courts take judicial notice of the fact that natural gas and oil are mined by means of deep wells drilled into the earth.

Kemp v. Barr Gas Co., —— Kan. ——, 175 Pacific 988, p. 989.

EMINENT DOMAIN.

MINING A PUBLIC USE—LIBERAL CONSTRUCTION OF STATUTE.

The power of the Legislature of Utah in making mining a public use is conceded, and the purpose of the statute should not be hindered by any narrow or technical objections. The importance of encouraging the mining industry of the State must be kept in view, and this was the object, intent, and purpose of the legislature in passing the act, and its wisdom, policy, and expediency were thereby determined, and a reasonable, fair, just, broad, and liberal view should be taken by the court in the interpretation of the provisions of the statute.

Monetaire v. Columbus Rexall Consolidated Mines Co., —— Utah ——, 174 Pacific 172, p. 176.

MINING—PUBLIC USE AND PUBLIC WELFARE.

There is a tendency to break away from the old rigid rules on the subject of "public use" and to enlarge the definition of the term so as to make it synonymous with "public welfare," and the test of "public welfare" instead of the old doctrine of "public use," is being gradually extended with the promise of its becoming the prevailing doctrine in most jurisdictions. This rule has been adopted and applied in the State of Utah to mining.

Monetaire v. Columbus Rexall Consolidated Mines Co., —— Utah ——, 174 Pacific 172, p. 176.

MINING A PUBLIC USE.

Section 3588 of the Utah Compiled Laws of 1907, as amended by the Laws of 1909 (p. 50), enumerates the specific purposes for which the right of eminent domain may be exercised. Subdivision 6 of this act provides that eminent domain may be exercised in behalf of roads, railroads, tramways, tunnels, ditches, flumes, pipes, and dumping places, to facilitate the milling, smelting, or other reduction of ore or the working of mines, quarries, coal mines, or mineral deposits; outlets, natural or otherwise, for the deposit or conduct of tailings, refuse, or water for mills, smelters, or other works for the reduction of ore, or for mines, quarries, coal mines, or mineral deposits; mill dams, natural gas or oil (pipe) lines, tanks, or reservoirs, also any occupancy in common with the owners or possessors of different mines, quarries, coal mines, mineral deposits, mills, smelters, or other places for the reduction of ores, or any place for the flow, deposit, or conduct of tailings or refuse matter. It was the intention of the legislature by this original section and by section 3590 to declare mining generally and the development of mines and mineral deposits a public use in furtherance of which the right of the exercise of eminent domain was applied with full force and effect.

Monetaire v. Columbus Rexall Consolidated Mines Co., —— Utah ——, 174 Pacific 172, p. 174.

PROPERTY DEVOTED TO PUBLIC USE—APPROPRIATION FOR SECOND USE.

The rule under the Utah statute is that property devoted to a public use can only be taken under the eminent domain statute "for a more necessary public use" than the one to which it is devoted. This rule does not prevent the appropriation under section 3588, Compiled Laws of 1907, as amended by the Laws of 1909 (p. 50), of the unused portion of an existing mining tunnel by a different mining company where it is not sought to appropriate the tunnel and to dispossess the owner of his property rights therein or of its use, but only to condemn the right to use the tunnel in common with the owner, and in fact to condemn the unused capacity of the tunnel. Such an appropriation does not deprive the owner of his ownership and use, but only to obtain a second right to use the property or right of way in common with the owner. In condemning the right of way to a joint use, or a use in common, all that the condemner gets or can get is the right to use that which the present owner possesses but which he does not and can not use. If the tunnel, the second right to the use of which was sought to be condemned, was used to its full capacity by the first owner, then there is nothing left to condemn; but where a tunnel is not used by the owner and possessor to its full capacity and it is reasonably clear that a joint use or a use in common is practicable, then the unused portion of such a tunnel may be condemned upon proper compensation being made to the owner and possessor thereof.

Monetaire v. Columbus Rexall Consolidated Mines Co., —— Utah ——, 174 Pacific 172, p. 176.

USE BY LANDOWNER OF LAND APPROPRIATED.

Land appropriated as a right of way for a railroad company may be put to many other uses besides operating a railroad thereon, and while the landowner may have a right to mine the ground condemned, he has no right to carry on mining operations upon the land so taken in such manner as to interfere with any proper use of the land by the railroad company.

Tyson Creek R. Co. v. Empire Mill Co., —— Idaho ——, 174 Pacific 1004, p. 1006.

PERMIT TO DIVERT WATERS FOR MINING PURPOSES—PROOF.

In appropriation proceedings for land for a right of way for a railroad, a permit issued by a State engineer to a person not a party to the proceedings granting the right to appropriate and divert waters for mining purposes on the lands in question is not admissible in evidence, especially where such permit was issued after the proceedings were begun and summons issued.

Tyson Creek R. Co. v. Empire Mill Co., —— Idaho ——, 174 Pacific 1004, p. 1006.

RIGHT OF WAY—CONDEMNATION OF MINING TUNNEL.

By section 3588 of the Utah Compiled Laws of 1907, as amended by the Laws of 1909 (p. 50), the right of eminent domain may be exercised to condemn an easement in or through an existing tunnel owned and used by a mining company. Subdivision 5 of section 3590, Compiled Laws of 1907, provides that all rights of way for any and all purposes mentioned in section 3588, shall also be subject to a limited use in common with the owners thereof when necessary. Tunnels, when necessary, are therefore subject to a limited use in common precisely as all other rights of ways or easements mentioned in the statute. It follows that where a tunnel is used for the purpose of transporting ore, but is not used to its full capacity by the owner, the owner of another mining claim may condemn the right to the joint use of the tunnel with the owner for the purpose of transporting ore.

Monetaire v. Columbus Rexall Consolidated Mines Co., —— Utah ——, 174 Pacific 172, p. 175.

RIGHT OF WAY—WATER FOR MINING PURPOSES.

The act of February 1, 1905 (33 Stat. 628), authorized a grant of rights of way for the construction and maintenance in national forests of dams, reservoirs, and water conduits to citizens and corporations for municipal or mining purposes and for the purpose of milling and reduction of ores. This act was intended to enlarge the rights theretofore existing and does not in any sense limit their enjoyment to the persons to whom they were granted. Under this act a right of way may be obtained by citizens or private corporations for the purpose of furnishing water for the operation of mining or mineral works not owned or operated by them.

Pine Mountain Water Co., In re, 46 Land Decisions 240, p. 242.

JOINT USE OF TUNNEL—NECESSITY.

The owner of a mine sought by appropriation proceedings to condemn a joint use of a mining tunnel, the use to be in connection with that of the owner of the tunnel, and where the tunnel was not used to its full capacity by the owner. Proof that the condemner owned a mine and that the cost of the construction of a separate tunnel would be too great to justify the construction of a separate tunnel and if the condemner can not reach his mineral deposits through the existing tunnel, the great cost of constructing a separate tunnel will prevent him from successfully developing and removing his mineral deposits. This is prima facia proof sufficient to show that it is necessary for the condemner to have a joint use of the tunnel in order to develop and mine the ores in his mining claim.

Monetaire v. Columbus Rexall Consolidated Mines Co., —— Utah ——, 174 Pacific 172, p. 178.

IMPROVEMENTS ON GROUND—PROSPECT HOLE.

A prospect hole on a placer mining claim is not an improvement within the meaning of the Statute of Idaho (sec. 5221, Revised Codes). Such a prospect hole adds nothing to the value of the land but only tends to show what its actual condition is.

Tyson Creek R. Co. v. Empire Mill Co., —— Idaho ——, 174 Pacific 1004, p. 1006.

DISCOVERY OF MINERAL—EFFECT ON VALUE.

After proceedings were instituted under the eminent domain statute for a right of way of a railroad and summons was served, gold was discovered within the ground sought to be appropriated. The gold was the property of the land owner and if in quantity and condition to be profitably mined he was entitled to show such fact in order to obtain compensation for any damage he might suffer by reason of interference by the location of the railroad in the use and enjoyment of his land for mining purposes. It was error for the court to instruct the jury to the effect that if the market value of the land was not affected by the presence of the mineral deposit at the time of the issuance of the summons then the evidence of mineral deposits could not be considered in fixing the damages to the land.

Tyson Creek R. Co. v. Empire Mill Co., —— Idaho ——, 174 Pacific 1004, p. 1006

APPROPRIATION OF RIGHT TO JOINT USE OF A TUNNEL—MEASURE OF DAMAGES.

Where it is sought to condemn a right to use a mining tunnel in connection with the use already made of the tunnel by the owner, the compensation to be paid therefor can not be fixed in a lump sum but some just method of compensation is all the law contemplates and is all that can be required in such a case. For this purpose where the parties are not able to agree some equitable method of determining and fixing the compensation for the joint use must be devised which must be based upon all the known facts and circumstances and must be such as to reflect justice in each case.

Monetaire v. Columbus Rexall Consolidated Mines Co., —— Utah ——, 174 Pacific 172, p. 176.

APPROPRIATION OF PROPERTY—BURDEN OF PROOF.

In a proceeding by one mine owner to condemn the right to a joint use of a mining tunnel where the tunnel was not used to its full capacity by the owner, the burden of proof rests upon the condemner to show that the use is a public use and that its exercise is necessary in the particular case. Both questions must be determined by the court and both must be determined in favor of the condemner as preliminary questions before the property or the right to an easement therein can be condemned. But as mining is by the statute made a public use and as the proposed condemnation or joint use of the tunnel was for mining purposes and to develop the mineral resources, the right sought to be acquired was for a public use.

Monetaire v. Columbus Rexall Consolidated Mines Co., —— Utah ——, 174 Pacific 172, p. 177.

WORDS OMITTED FROM PUBLISHED ACT.

Section 3588 of the Utah Compiled Laws of 1907 in reciting the purposes for which the right of eminent domain may be exercised among other things recited: "natural gas or oil-pipe lines or reservoirs." The act as published officially reads: "natural gas or oil lines, tanks or reservoirs." The court in construing the act followed the correct printing as found on file in the office of the secretary of state.

Monetaire v. Columbus Rexall Consolidated Mines Co., —— Utah ——, 174 Pacific 172, p. 175.

MINING TERMS.

CASING LINE.

A casing line is a large strong rope used in oil-well drilling to raise and lower the casing.

Long *v.* Foley, —— W. Va. ——, 96 Southeastern 794, p. 794.

CLAIM JUMPING.

The location of a mining claim on supposably excess ground within the staked boundaries of an existing claim on the theory that the law governing the manner of making the original location had not been complied with is called "claim jumping."

Nelson *v.* Smith, —— Nev. ——, 176 Pacific 261, p. 265.

HOLE MAN.

A "hole man" in mining operations is an employee whose duty it is to load the holes with explosives after they have been drilled.

De Nardo *v.* Stephens-Jackson Co., —— Pa. ——, 104 Atlantic 584, p. 585.

GRIZZLIES.

Grizzlies are iron or steel bars used to sort or separate the rock or ore as it falls into the ore chutes.

Suborich *v.* Alaska United Gold Min. Co., 251 Federal 885, p. 886.

JACK POLE.

A jack pole or post is a pole set solidly in advance of a coal-cutting machine and to which is attached the chain that moves the machine forward in the process of coal cutting.

James *v.* Winnifred Coal Co., —— Iowa ——, 169 Northwestern 120, p. 123.

RABBLE RAKE.

A rabble rake is a rake constructed of metal which revolves on a track and passes over or through the molten mass of ore in the kiln for the purpose of stirring the hot ore.

Athletic Min. & Smelting Co. *v.* Sharp, —— Ark. ——, 205 Southwestern 695, p. 696.

SKIDDOO BELL.

A skiddoo bell is a signal or bell installed at the bottom of a shaft by which the hoisterman may give warning of falling material to the workmen at the bottom of the shaft.

Honey *v.* St. Regis Min. & Smelting Co., —— Mo. ——, 205 Southwestern 93, p. 94.

SPRAG.

A sprag is a short piece of wood or prop put under the coal immediately after the coal is cut under to hold the coal and keep it from falling until the loader is ready to let it down and haul it out.

James *v.* Winnifred Coal Co., —— Iowa ——, 169 Northwestern 120, p. 123.

STABBER.

A term employed in the work of tubing oil and gas wells to the person whose duty it is to guide the joints suspended by a rope from the derrick to connect with other joints placed in the well.

Long *v.* Foley, —— W. Va. ——, 96 Southeastern 794.

MINING CORPORATIONS.

SHARES OF STOCK—NATURE AS PROPERTY.

Shares of stock in a corporation do not constitute negotiable paper, but are sometimes spoken of as possessing elements of quasi negotiability and the necessities of business require that shares of stock shall be treated prima facie as evidence of unincumbered ownership of the holder thereof named in the certificate and upon the books of the company.

Paine, Webber & Co. v. Arkansas & Arizona Copper Co., —— Ark. ——, 206 Southwestern 447, p. 449.

SITUS OF SHARES OF STOCK.

Ordinarily the situs of shares of stock of a mining company is at the residence of the owner or at the domicile of the corporation.

Warren v. Brown, —— Mass. ——, 121 Northeastern 69, p. 70.

ISSUE OF STOCK—SUFFICIENCY OF CONSIDERATION—VALUE OF SERVICES.

The constitution of Kentucky (sec. 193), provides that no corporation shall issue stock except for an equivalent in money paid, labor done, or property actually received and at a greater value than the market price for such labor or property. This provision forbids the issue of stock in exchange for work or services except when the market price of such work or services shall be equal to the par value of the stock issued.

Detroit-Kentucky Coal Co. v. Bickett Coal & Coke Co., 251 Federal 542, p. 546.

CONTRACT FOR SALE OF STOCK—CONSIDERATION.

Under the Kentucky constitution and statute prohibiting the issuing of corporation stock for services unless the value of the services rendered shall equal the par value of the stock, it is the right and duty of a corporation to refuse to carry out a contract to issue stock in payment of services where the par value of the stock is clearly and largely in excess of the value of such services; and the corporation may be enjoined and specific performance of such a contract can not be enforced. Such a contract can not be validated by an offer on the part of the purchaser of the stock, made after the suit was commenced, to pay a stated sum of money in addition to the services rendered, and especially where there was nothing to show that the value of the services rendered and the sum proposed to be paid equalled the amount of stock proposed to be issued.

Detroit-Kentucky Coal Co. v. Bickett Coal & Coke Co., 251 Federal 542, p. 546.

SALE OF STOCK—PAYMENT IN SERVICES—ENTIRE CONTRACT—INVALID IN PART.

The constitution and statutes of Kentucky forbid the issuance of corporate stock for services unless their value shall equal the face value of the stock. A Kentucky coal company largely indebted and in failing circumstances entered into an agreement with a third person by which the capital stock of the coal company was to be increased and such third person was, in consideration of securing certain stated financial aid for the corporation and by which it could pay its existing debts, and begin the mining of coal, to receive and to have issued to him 51 per cent of the capital stock of the coal company. This contract was clearly illegal as against the provisions of the constitution and the statutes and the stock provision is not separable from the other provisions of the contract so that the remaining provisions can not be specifically enforced. The finance contract and the sales contract are interdependent and are interwoven, the substantial consideration of each being the agreement to furnish money for development and operation. The contract is entire and as an inseparable part is void, it can not be enforced.

Detroit-Kentucky Coal Co. v. Bickett Coal & Coke Co., 251 Federal 542, p. 547.

PROPERTY OF STOCKHOLDERS—SHARES OF STOCK—NATURE.

In most aspects the property of stockholders in mining corporations in their respective shares of stock is separate and distinct from the property of the corporation. But in a remote sense a certificate of stock is an interest in the property of the corporation which may be in a State different from either the corporation or the certificate of stock.

Warren v. Brown, —— Mass. ——, 121 Northeastern 69, p. 70.

TRANSFER OF STOCK—BONA FIDE PURCHASER.

Stock brokers purchasing the stock of a mining company from a stranger or selling such stock on the market under their guarantee are not entitled to protection as bona fide purchasers and can not compel a reissue of stock to them by the corporation, where the certificates had been embezzled by an employee who from a room in a hotel in Kansas City wired the brokers in Boston to make the sale and to remit proceeds, and who subsequently sent a second wire removing any price limit, and offering to accept ten to twelve cents less than the market price for the stock and insisted on a sale at any price and of a prompt return of the proceeds; and where the name of the seller was not the name in the certificates of stock and no effort was made on the part of the brokers to require a guarantee of the party selling or to require the seller to identify himself as the owner of the shares.

Paine, Webber & Co. v. Arkansas & Arizona Copper Co., —— Ark. ——, 206 Southwestern 447, p. 449.

AGENCY—SALE OF STOCK—CONSTRUCTION.

A contract of agency authorized the agent to sell and dispose of the shares of stock owned by the principal in any joint stock or incorporated company but limited the agency "to cover the State of Nevada only." The parties to the agreement had been engaged as joint owners of a mine and mining claims in Nevada but had ceased to be jointly active and the principal had gone to a foreign country. The Nevada property was purchased by a mining company organized in the State of Maine and the parties to the agreement had received shares of stock of the mining company in payment for their interest in the mining property in Nevada. Read in the light of the relation of each of these parties to the other and to the property rights centering in Nevada the contract of agency must be construed to have reference to the property in the State of Nevada although the mining corporation had its residence in the State of Maine.

Warren v. Brown, —— Mass. ——, 121 Northeastern 69, p. 70.

RIGHT OF STOCKHOLDER TO SUE—RELATION OF STOCKHOLDER—PLEADING.

In an action by a stockholder against a mining corporation and others to rescind certain alleged fraudulent transactions on the part of the corporation, an averment that the complainant owned a certain percentage of the stock of the corporation is sufficient to show him to be a stockholder and the question of whether he should be permitted to maintain the suit is a matter of defense.

Steitz v. Old Dominion Copper Min. & Smelting Co., —— N. J. Equity ——, 104 Atlantic 214, p. 215.

SUIT BY STOCKHOLDER—FAILURE TO REQUEST CORPORATION TO SUE.

A stockholder of a foreign corporation brought suit for the rescission of certain alleged fraudulent transactions or in lieu thereof for an accounting. A motion for a nonsuit can not be sustained on the ground that there is no sufficient showing of an effort to have the corporation sue for the alleged wrong and no sufficient excuse for not making such effort, where it appears from the bill that the corporation itself had long since been abandoned by the officers and managing agents charged with the fraudulent transaction, and where the allegations of the bill show sufficient reason for suit by a stockholder instead of the corporation itself.

Steitz v. Old Dominion Copper Min. & Smelting Co., —— N. J. Equity ——, 104 Atlantic 214, p. 215.

STOCKHOLDER'S SUIT—PARTIES—FRAUD AND ACCOUNTING.

A stockholder's suit demanding a rescission of certain alleged fraudulent transactions, or an accounting of the resultant profits of such transaction, will not be dismissed in view of the New Jersey chancery rule because the original corporation which had in fact long ceased to exist and the new corporation that was formed as a culmination of the alleged fraudulent transaction were not made parties, where the persons and corporations perpetrating the alleged fraud were parties to the suit.

Steitz v. Old Dominion Copper Min. & Smelting Co., —— N. J. Equity ——, 104 Atlantic 214, p. 215.

STOCKHOLDER'S SUIT—LACHES—PLEADING.

A suit by a stockholder for the rescission of alleged fraudulent transactions by the officers and managing agents of the corporation will not be dismissed on the ground of laches and for a failure for a period of 25 years to sue, where the allegations of the bill are sufficient to show a reasonable excuse for the delay.

Steitz v. Old Dominion Copper Min. & Smelting Co., —— N. J. Equity ——, 104 Atlantic 214, p. 215.

STOCK HELD IN TRUST UNDER POOLING AGREEMENT—AUTHORITY TO SELL.

The owners of mining property in Nevada sold it to a mining company organized in Maine and accepted shares of the stock in payment for the property. Thereafter a pooling agreement was entered into by the stockholders and all the stock transferred to a trustee to hold under that agreement. One of the former joint owners of the mining property, who had left the country, gave his former joint owner a power of attorney to sell the shares of stock owned by him in any "joint stock or incorporated company," but limited the power "to cover the State of Nevada only." This authority when construed in connection with the relation of the parties, their former joint ownership of the mining property, the sale and acceptance of the stock in payment was sufficiently broad, as against the express limitation, to authorize the agent to sell and dispose of the stock of the Maine mining company held in trust under the pooling agreement; and the principal, executing the power of attorney, can not compel the mining comany to issue to him shares of stock in lieu of those sold and transferred by the trustee under the pooling agreement.

Warren v. Brown, ——, Mass. ——, 1721 Northeastern 69, p. 70.

AUTHORITY OF PRESIDENT TO EXECUTE NOTES.

The president of a mining corporation has no implied authority to execute notes of the company without the consent or order of the directors. The fact that the president owned nearly all of the stock does not give him such authority.

Goodman Mfg. Co. v. Mammouth Vein Coal Co., —— Iowa ——, 168 Northwestern 912, p. 914.

AUTHORITY OF PRESIDENT—GRANT OF LAND—RIGHT OF WAY.

The board of directors of a sulphur-mining company authorized its president to sell and convey to a canal company a right of way through and across its property. By inadvertance or otherwise the conveyance by the president was for the land itself to be covered by the right of way. The president, under the authority given him to convey a right of way, which is only a servitude, had no power to convey and transfer the fee simple title to the land, and the corporation may, by proceedings in equity, set aside the conveyance or confirm it as a sale of a servitude only.

Louisiana Sulphur Min. Co. v. Brunstone, etc., Canal Co., —— La. ——, 79 Southern 324, p. 325.

UNAUTHORIZED CONVEYANCE BY PRESIDENT—REFORMATION DENIED.

The board of directors of a mining corporation by a resolution authorized its president to execute a deed or instrument conveying a right of way to a canal company for a canal over and through the lands of the mining company. The president, inadvertently or otherwise, executed a deed absolute for the strip of ground for the canal instead of a deed granting a mere servitude and right of way. The mining company is not entitled to a reformation of the deed of conveyance in the absence of proof of a mistake on the part of the canal company. The estate in the land desired by the canal company and its intention in this regard could be shown only by proof of a resolution of the board of directors of the canal company; and in the absence of such proof a reformation of the instrument must be denied, as equity can reform an act only to make it conform to the true intention of the parties.

Louisiana Sulphur Min. Co. v. Brunstone, etc., Canal Co., —— La. ——, 79 Southern 324, p. 326.

KNOWLEDGE OF OFFICERS—INNOCENT PURCHASER.

A mining corporation taking the assignment of an oil and gas lease from its principal officers, who had full information of the rights of third persons, can not occupy the position of an innocent purchaser without notice.

Wallawalla Oil, Gas & Pipe Line Co. v. Vallentine, —— Wash. ——, 174 Pacific 980, p. 981.

AGENCY—DECLARATIONS OF AGENT—RES GESTAE.

Where an agency is prima facie established by the acts of the alleged agent in the sale and conveyance of mining property, the declarations of the alleged agent are admissible in corroboration where they constitute a part of the res gestae and were made at the time of the transaction and may show that the agent acted as such and not on his individual account.

Hope v. Berger Min. Co., —— Cal. App. ——, 174 Pacific 932, p. 934.

AGENCY—PROOF.

In an action by a corporation in relation to mining property purchased by it through a promoter the acts themselves of the promoter are competent evidence of his agency.

Hope v. Berger Min. Co., —— Cal. App. ——, 174 Pacific 932, p. 933.

CORPORATE LIABILITY STATUTE—APPLICATION TO INJURIES.

The Arkansas corporate liability act (Acts 1913, p. 734), as correctly published by the secretary of state, applies to all injuries inflicted by a corporation and is not confined to injuries in death cases only.

Athletic Min. & Smelting Co. v. Sharp, —— Ark. ——, 205 Southwestern 695, p. 697.

LIABILITY OF PROMOTERS—FRAUD—PROOF AND INFERENCES.

A corporation was organized to purchase and operate a mining property in Montana. One of its organizers was active in its promotion and after the organization of the company sold his stock. In an action against the estate of the deceased organizer and stockholder it was charged that as a promoter he was interested with an agent who sold the mining property to the corporation and received a share of the commission but fraudulently concealed the fact from his associates and that he represented that in the purchase of the property no commission was to be paid out of the purchase money. The evidence showed that the deceased promoter did receive a large sum from the purchase money paid for the property, but it was reasonably possible under the evidence that it was received by him for a different purpose and one that did not involve him in the alleged breach of faith and the alleged fraud on his associates. But his death, instead of permitting adverse inferences, made it necessary to show his alleged fraud by substantial proof, and the evidence in support of the charge of fraud is not such as to warrant a decree against his estate.

Gould Mines Co. v. Bauer, 250 Federal 770, p. 778.

LEASE OF LAND—LIABILITY FOR IMPROVEMENTS.

A mining company leased its land by an oral contract to a lessee and orally agreed that the lessee might remove improvements placed upon the land, but if preferred the mining company would pay the lessee the value of such improvements. The oral lease was void under the statute of frauds and was determinable at the pleasure of the mining company. But the agreement to pay for the improvements was not within the statute of frauds and on the termination of the lease by the mining company it was liable to the lessee for improvements upon the ground, and this liability included the value of fruit trees or an orchard planted upon the land by the lessee.

Fredell v. Orman Min. Co., —— N. C. ——, 97 Southeastern 386, p. 387.

CONTRACTS OF INDIVIDUAL AND OF CORPORATION—ENFORCING.

A contract by which the individual contractors agreed to pay for the development of mining property and by which a mining corporation undertook to issue certain stock and pay certain dividends to the contractees developing the mining property, is so far separable that both contracts could be enforced in a single action, or the two could be enforced in separate actions. The fact that an action had been brought to enforce the entire agreement, and the court disclaimed it power to pass upon one part of the agreement, is not a bar to a subsequent action against the mining company to enforce the part of the agreement ratified and assumed by it.

Beltz v. Great West Lead Mfg. Co., 251 Federal 696, p. 699.

EVIDENCE—ADMISSIBILITY OF BOOK ENTRIES.

In an action against a mining corporation to recover the salary of the mine manager the entries in the books of the company made by the mine manager showing the amount of his salary due monthly are properly admissible in evidence.

Schneider v. Oakman Consolidated Min. Co., —— Cal. App. ——, 176 Pacific 177, p. 178.

SALARY OF MINE MANAGER—AGREEMENT—CONTINUED SERVICE.

A mining corporation employed a mine manager at a stated salary per month from June 3, 1911, to January 1, 1913. After the expiration of this time the mine manager continued working about the affairs of the company, keeping the mine in condition to show to prospective purchasers, performing assessment work on the claims, and otherwise continued working for the company. The law is that where a person employed at a fixed salary continues in the same employment without any new contract, the presumption is that the continued employment is at the same salary.

Schnieder v. Oakman Consolidated Min. Co., —— Cal. App. ——, 176 Pacific 177, p. 178.

BOOK ACCOUNTS—STATUTE OF LIMITATIONS—PROMISE TO PAY.

A mining corporation owed $1,500 as a balance of the purchase price of a mining claim and a mine. On beginning operations the mining company employed the seller as its mine manager at a stated salary per month. The monthly items of salary were entered in the books of the company and paid for the period of employment. The mine manager continued working for the company without a renewal contract and subsequently entered the salary indebtedness as an item in his account due from the company. In an action to recover the amount of the unpaid salary and the balance of the purchase price the mining company can not successfully plead the statute of limitations to the $1,500 item, where the president and officers of the company had promised in writing that the claim would be paid, or that "the matter will surely be taken care of in due time."

Schneider v. Oakman Consolidated Min. Co., —— Cal. App. ——, 176 Pacific 177, p. 179.

INDEBTEDNESS—ACCOUNTS STATED—FAILURE TO OBJECT.

A mining corporation requested its mine manager to render an account for his services and for all sums he claimed to be due him from the corporation. Pursuant to the request the mine manager submitted the statement of his account showing all items due. When the account was rendered it became the duty of the mining company to make seasonable objection thereto if any it had, and on failure to do so the account became an account stated and the foundation of an independent cause of action which rests thereon when a reasonable time has elapsed without any objection being made thereto. Under certain circumstances a failure to object for six months is unreasonable and in one instance where a space of 25 days elapsed without objection being made on the part of the debtor it was sufficient to establish the account as an account stated.

Schneider v. Oakman Consolidated Min. Co., —— Cal. App. ——, 176 Pacific 177, p. 179.

ACTION AGAINST—SPECIAL APPEARANCE—JURISDICTION OF COURT.

A mining company entered a special appearance to an action and moved the court to vacate, quash, and annul the service of summons. This did not invoke the jurisdiction of the court and give the court jurisdiction of the person of the corporation, but constituted a special appearance only. On the overruling of its motion the defendant corporation did not waive its objection to the jurisdiction by pleading to the merits without asking affirmative relief.

Matson v. Kennecott Mines Co., ——Wash. ——, 175 Pacific 182.

Matson v. Kennecott Mines Co., —— Wash. ——, 171 Pacific 1040, rehearing granted.

See Macario v. Alaska Gastineau Min. Co., 96 Wash. 458, 165 Pacific 73.

FAILURE TO APPEAR AT TRIAL—RELIEF FROM JUDGMENT.

Where there has been a trial of a case in the absence of defendant mining corporation, or where a default judgment was rendered on failure of the mining corporation to answer and no exceptions were saved to the action of the trial court, the rulings of the court can not be reviewed on appeal unless the questions raised are jurisdictional.

Uncle Sam's Oil Co. v. Richards, —— Okla. ——, 176 Pacific 240.

FOREIGN CORPORATION—VENUE OF SUITS.

The statute of Alabama (sec. 6112, Code) provides that a foreign or domestic corporation may be sued in any county in which it does business by agent.

Tennessee Coal, Iron, etc., Co. v. Bunn, —— Ala. ——, 79 Southern 360, p. 361.

FOREIGN CORPORATION—VENUE OF SUITS—LEGISLATIVE AUTHORITY.

The legislature was the sole and exclusive judge of the expediency and wisdom of the statute making foreign corporations suable in places other than that named in the constitution so long as the rights thereby guaranteed were not affected, and the legislature may grant the right to sue a foreign corporation in counties other than those expressly enumerated in the constitution.

Prairie Oil & Gas Co. v. District Court, —— Okla. ——, 174 Pacific 1056, p. 1057.

FOREIGN CORPORATION—VENUE OF SUITS—VALIDITY OF STATUTE.

The constitution of Oklahoma authorizes suits to be maintained against a foreign corporation "in the county where an agent of such corporation may be found, or in the county of the residence of the plaintiff, or in the county where the cause of action may arise." The act of 1911 (Session Laws 1910-11, p. 46) authorizing suits to be filed against any foreign corporation doing business within the

State in any county where the corporation has property is not unconstitutional.

Prairie Oil & Gas Co. v. District Court, —— Okla. ——, 174 Pacific 1056, p. 1057.

SUIT AGAINST FOREIGN CORPORATION—JURISDICTION OF COURT.

A resident stockholder of New Jersey brought suit in that State against a certain named foreign corporation and others for alleged fraudulent transactions of the officers and managing agents of such foreign corporation in which the complainant held stock and by reason of which transactions he was defrauded and damaged. A motion to dismiss the bill on the ground that the court has no jurisdiction to investigate the affairs of a foreign corporation where it had no property within the State can not be sustained where the matters involved in the bill are not internal matters of such foreign corporation but are matters based upon allegations of fraud committed by officers and directors of the corporation against its stockholders.

Steitz v. Old Dominion Copper Min. & Smelting Co., —— N. J. Equity ——, 104 Atlantic 214, p. 215.

"DOING BUSINESS"—TAXATION OF TANK CARS.

The New Jersey Tank Line Company has its principal business office in the State of New York, its business consists in owning and keeping in repair and leasing to railroads its tank cars. Its leases are made in New York City and its rents are paid there. It receives a certain mileage from the railroad over which its tank cars are operated by the lessees and this is paid as part of the rental and the business of operating such tank cars is entirely that of the lessees. The tank company has no office, place of business, agent, or employee in Louisiana and is consequently not "doing business" in that State and the statute of Louisiana does not confer authority upon the State board of appraisers to assess tank cars within the State.

Union Tank Line Co. v. Day, 143 La. ——, 79 Southern 334, p. 335.

MALICIOUS PROSECUTION—LIABILITY.

A mining corporation is liable on a charge of malicious prosecution where it wrongfully procured the arrest and subsequent criminal proceedings on the charge that the person arrested was a labor agent acting without a license under the Virginia law, although the person making the arrest was in the employ of a special detective agency but was giving his entire time and attention to the service and interests of the mining company, and where the company called him a special officer and secured him from the detective agency, and his duties in part were to look after the labor situation, including any violation of law occasioned by labor agents and where the warrant for the arrest was issued at the instance of the general superintendent of the mining company, and where the warrant was subsequently dismissed by order of the superintendent without further prosecution.

Clinchfield Coal Corp. v. Redd, —— W. Va. ——, 96 Southeastern 836, p. 838.

MALICIOUS PROSECUTION—ARREST BY PUBLIC OFFICER—LIABILITY.

A mining corporation can not escape liability for malicious prosecution on the ground that the officer making the arrest was acting within his public duties and authority and was not the agent of the mining company, where it appeared that the special officer was employed by a detective agency, but he had given his entire time and attention to the service and interests of the mining company and was called its special officer and was secured from the detective agency for the purpose of keeping order in and around the camp and his duties included looking after the labor situation and any violation of law occasioned by labor agents.

Clinchfield Coal Corp. v. Redd, —— W. Va. ——, 96 Southeastern 836, p. 839.

MALICIOUS PROSECUTION—LEGAL ADVICE—DEFENSE.

In order that legal advice may be used as a shield against a suit for malicious prosecution instituted against a mining corporation, the legal advice must be given by a person accepted and licensed by the courts as one learned in the law and competent to be advisor to clients and to the court. But a mere consultation with a justice of the peace on the part of the superintendent of a mining company and the issuance of a warrant at the instance or the superintendent can not, in any sense, be deemed legal advice within the meaning of the rule.

Clinchfield Coal Corp. v. Redd, —— W. Va. ——, 96 Southeastern 836, p. 839.

FORFEITURE OF FRANCHISE—CONSTITUTIONAL AND STATUTORY PROVISION—CONSTRUCTION.

A constitutional or statutory provision for the forfeiture of a charter of a mining corporation to become effective before any legal step has been taken on the part of the State for the assertion of the forfeiture is in derogation of the common law and must be strictly construed.

Elliott's Knob Iron, Steel & Iron Co. v. State Corporation Commission, —— Va. ——, 96 Southeastern 353, p. 356.

FORFEITURE OF CHARTER—STATUTORY FORFEITURE WITHOUT JUDICIAL PROCEEDINGS.

It requires strong and unmistakable language to authorize a court to hold that the legislature intended to dispense with all judicial proceedings declaring a forfeiture of a charter and the dissolution of a corporation.

Elliott's Knob Iron, Steel & Iron Co. v. State Corporation Commission, —— Va. ——, 96 Southeastern 353, p. 356.

PRESUMPTION OF CONTINUED EXISTENCE—FORFEITURE OF CHARTER.

Every presumption is in favor of the continued existence and against the conclusion that the charter of a corporation has been forfeited and courts are disinclined to hold that the charter of a corporation has been forfeited, where neither the Commonwealth nor a private person is claiming that such forfeiture has occurred.

Elliott's Knob Iron, Steel & Iron Co. v. State Corporation Commission, —— Va. ——, 96 Southeastern 353, p. 356.

FAILURE TO PAY REGISTRATION FEE—FORFEITURE OF CHARTER.

The constitution and statutes of Virginia require mining corporations to pay annual registration fees and also provide for the making of annual reports. The failure to pay the registration fee or to make the annual report shall after a stated time operate as a revocation and annulment of the charter of any such corporation. The object of these provisions is not the forfeiture of the charter but the collection for the Commonwealth from every corporation of an annual registration fee and to compel the making of annual reports. The revocation and annulment of the charter on failure is a penalty to be imposed for the failure of a corporation to do the acts required. It is the manifest intent of the constitution and statutes that a corporation shall continue in existence as a source of revenue to the Commonwealth and a forfeiture of its charter defeats such purpose. The constitutional provision is not self-executing and the mining company can not claim that by its failure to pay its annual registration fee it ipso facto forfeited its charter and its existence was so far ended and it was not in being, so as to be assessable with any registration fee or franchise tax for succeeding years.

Elliott's Knob Iron, Steel & Iron Co. v. State Corporation Commission, —— Va. ——, 96 Southeastern 353, p. 356.

PRINCIPAL AND AGENT.

AGENCY CONTRACT—CONSTRUCTION.

It is permissive to show the circumstances under which a written instrument was executed so far as actually or presumably present to the minds of the parties for the purpose of enabling a court to understand their situation and to apply their words to the right subject matter in the light of all the attendant conditions. Parol testimony is admissible in such case, not to control the written words but to apply them to their proper objects.

Warren v. Brown, —— Mass. ——, 121 Northeastern 69, p. 70.

CONTRACT OF AGENCY—CONSTRUCTION—SALE OF MINING STOCK.

The owner of certain mining stock executed a power of attorney to another owner of the same stock authorizing the attorney in fact to demand and receive sums due him for or in respect to any share, stock, or interest which he owned and to sell and absolutely dispose of such shares of stock and generally to act in relation to his estate as fully as he could do if personally present. The power of attorney was to remain in force one year and to cover the State of Nevada only. This power of attorney or contract of agency was sufficiently comprehensive to authorize the attorney in fact to transfer the interest of the person executing the power, although no shares of stock stood in his name, but he was the beneficial owner of stock standing in the name of a third person who held such stock as trustee solely for the purpose of executing a pooling agreement. The beneficial right of the principal in the shares thus held was included in the descriptive words "interest in any incorporated company," used in the power of attorney.

Warren v. Brown, —— Mass. ——, 121 Northeastern 69, p. 70.

PROOF OF AGENCY—ACTS OF AGENT.

In a controversy over the title to mining property where the sale was negotiated by a person representing himself to be the agent of the owner, the acts themselves of the alleged agent are competent evidence of his agency.

Hope v. Berger Min. Co., —— Cal. App. ——, 174 Pacific 932, p. 933.

ADMISSIBILITY OF DECLARATION OF AGENT.

A prima facie case of agency on the part of a promotor of a corporation in making a sale of mining property to the corporation, may be made by proof of the acts of the alleged agent. When such prima facie case is made then the declarations of the agent in making the sale are admissible in evidence as a part of the res gestae.

Hope v. Berger Min. Co., —— Cal. App. ——, 174 Pacific 932, p. 934.

POWER OF ATTORNEY—CONSTRUCTION—PLACE OF PERFORMANCE.

A power of attorney executed by the owner of a mining company organized in the State of Maine for the purpose of owning and operating mining property in the State of Nevada authorized the agent and attorney in fact to sell and dispose of any shares of stock held by the grantor in any joint stock or incorporated company. The power of attorney was to remain in force one year and "to cover the State of Nevada only." The limitation of the power to the State of Nevada means that the power of attorney was to be exercised as to property either physically located within that State or deriving its value from ownership of property physically located within that State. The principal and the agent had engaged as joint owners of a mine and mining claims in Nevada, but had ceased to be conjointly active and the grantor had gone to a foreign country. He was giving to his coadventurer a power of attorney with a wide grant of authority for all practical purposes, but was confining it to matters connected with their common rights in mining interests, and there was no other subject matter upon which it could operate, and the grantor had no property in Nevada except that connected with the mining venture in which he and the attorney in fact were interested; and the agreement must be construed to mean that it was to be effective respecting all properties which derived their value from real or personal estate located within the State of Nevada.

Warren v. Brown, —— Mass. ——, 121 Northeastern 69, p. 70.

LABOR AGENT—CONSTRUCTION OF STATUTE.

The statute of Virginia provides that any person who solicits, hires, or contracts with laborers to be employed by persons other than himself and every agent of such person shall be deemed to be a labor agent. Every such person who shall without a license conduct business as a labor agent is subject to a fine. This statute can not be construed to apply to "every agent of any person who hires laborers" and not "every agent of any person who hires laborers for others than himself." The statute does not prohibit any person, or the agent of any person, who needs men for his own work from hiring them without obtaining a license. What the statute aimed at was "irresponsible and itinerant labor agents," and the words "and every agent of such person" plainly and unmistakably refer to the person "who hires" as a labor agent and not to the "persons other than himself" for whom the laborers are hired.

Clinchfield Coal Corp. v. Redd, —— W. Va. ——, 96 Southeastern 836, p. 843.

SALE OF MINING CLAIM BY AGENT—RATIFICATION BY PRINCIPAL—ESTOPPEL.

Where one person without title or authority from the real owner of a mining claim assumes to sell and convey the claim and the true owner knowing the facts consents to and accepts the proceeds of the sale in full satisfaction of his interest, it should in equity operate as a confirmation of the unauthorized sale and preclude the real owner from thereafter asserting his legal title. A sale under such circumstances is treated as the act of the real owner, or it operates in connection with the receipt of the purchase money as an agreement on his part to sell to the purchaser and as payment by the latter to the true owner of the consideration.

Moore v. Rochester Weaver Min. Co., —— Nevada ——, 174 Pacific 1017, p. 1018

LAND DEPARTMENT.

BUREAU TO DISPOSE OF PUBLIC LANDS—EXCLUSIVENESS.

The sale and disposal of the public lands, including oil lands, has been placed by statute under the control of the Land Department, at the head of which is the Secretary of the Interior, and which includes a bureau headed by the Commissioner of the General Land Office, to whom, as a special tribunal with quasi judicial powers, Congress has confided the execution of the laws enacted for the sale and disposal of the various kinds of public lands.

Devil's Den Consolidated Oil Co. v. United States, 251 Federal 548, p. 554.

JURISDICTION AND JURISDICTION OF COURT.

A court can not lawfully anticipate what the decision of the Land Department may be in respect to any contest arising before it nor direct in advance what its decision should be even in matters of law and much less in respect to matters of fact.

Devil's Den Consolidated Oil Co. v. United States, 251 Federal 548, p. 554.

DECISION OF SECRETARY CONCLUSIVE.

The facts in respect to the mineral character of public land applied for under the laws authorizing its disposition, as well as the facts in respect to the performance of the acts required by the law to be performed by the applicant for a patent, are for the exclusive determination of the Land Department.

Cameron v. United States, 250 Federal 943, p. 946.

POWER TO SET ASIDE LOCATION.

The Land Department when it rejects an application for a mineral patent can go further and set aside the mining location; and it can therefore by direct proceedings, upon notice, set it aside and restore the land to the public domain.

Cameron v. United States, 250 Federal 943, p. 946.
See Clipper Min. Co. v. Eli Min. & Land Co., 194 U. S. 220, p. 223.
Daniels v. Wagner, 205 Federal 238.

PUBLIC LANDS.

APPLICATION FOR LEASE—CONSTRUCTION OF STATUTE.

The amendatory act of 1917 of Washington (p. 599) provides that any citizen finding precious minerals upon the State lands may apply to the commissioner for a lease of any amount not exceeding 80 acres for prospecting purposes, the application to be made by legal subdivisions according to the public land surveys. Prior to this amendatory act, the applicant was required to post up a location notice, set corner posts, and mark the boundaries of the land upon the ground as provided by the United States mining statutes. This amendatory act, though not repealing the existing law, renders it unnecessary for the applicant to post a location notice, set corner posts, and mark the boundaries.

State v. Savidge, —— Wash. ——, 175 Pacific 568, p. 569.

MINERS' LIENS.

STATEMENT OF CLAIM—ESSENTIAL ELEMENT—MANUAL LABOR.

The California amendatory act of 1911 (p. 1313) gives persons who perform labor in any mining claim a lien for the value of the labor done. The statute provides that the superintendent shall be considered the agent of the owner for the purposes of that act. This is the only statute on the subject of liens applicable to an oil well. The provisions of this act are to be liberally construed with a view of protecting and promoting the legitimate interests of the laborer; but there must be a substantial compliance with the requirements of the law in order to enforce the remedy against the property. A total omission of the essential element of a lien, the performance of manual labor, renders the claim too fragile to support any judgment foreclosing the lien.

McCreary v. Toronto Midway Oil Co., —— Cal. App. ——, 175 Pacific 87.

CLAIM FOR SALARY—SUFFICIENCY.

Under the California statute a claim for a lien against an oil well by an employee of the oil company is insufficient where it merely states that the claimant had been employed by the oil company for a certain stated time, and is still employed and that no part of his salary had been paid since a certain stated date and that during such time he has been employed as superintendent of the oil operations of the oil company named.

McCreary v. Toronto Midway Oil Co., —— Cal. App. ——, 175 Pacific 87.

SUPERINTENDENT OF OIL COMPANY—RIGHT TO LIEN.

The statute of California of 1911 (p. 1313), gives persons who perform labor in any mining claim a lien for the value of the labor done. The statute makes the superintendent the agent of the owner for the purposes of the act, and there is no other statute expressly giving a right to a mechanic's lien upon an oil well, and this statute limits the lien to the value of the labor done. Under this statute the claim of the superintendent of an oil company for unpaid salary as superintendent of the oil operations can not be enforced. The claim of a superintendent as such is not subject to lien since it does not come within the purview of the statute.

McCreary v. Toronto Midway Oil Co., —— Cal. App. ——, 175 Pacific 87.
See Durheimer v. Copperopolis Copper Co., 55 Oreg. 57, 104 Pacific 895.

ESTATE SUBJECT TO LIEN.

The statute of Idaho (Revised Code, sec. 5110) gives a person who performs labor in any mine a lien upon the same for the work whether done at the instance of the owner or his agent; but the lessee of a mining claim shall not be considered as the agent of the owner. Under this statute the interest given to the optionee in a contract to purchase a mine coupled with the right of possession under certain conditions is not lienable for work done at the instance of a tenant of such optionee, unless the optionee himself caused the work to be done or made the tenant his agent within the meaning of the statute. But to do either would require some general act or arrangement over and above the mere granting possession of the premises upon condition that the lessee would occupy and use the same for certain purposes and under certain rights and privileges at his own expense and return to the owner a portion of the profits.

Nicholson v. Smith, —— Idaho, ——, 174 Pacific 1008.
See Black v. Murray, 12 Mont. 545, 31 Pac. 550.

MINING CLAIMS.

NATURE AND GENERAL FEATURES.

VALIDITY OF CLAIM—UNITED STATES AND STATE STATUTES.

If a mining location or claim is invalid under the United States mining statutes it is also invalid under the State statutes.

Nelson v. Smith, —— Nev. ——, 176 Pacific 261, p. 263.

RIGHT OF LOCATION—PRIVILEGE AND POSSESSION.

The right of a locator upon mineral lands of the United States is a privilege granted by Congress, but it can only be exercised within the limits of the prescribed grant, and if there is not a valid location there can be no possession under it.

Nelson v. Smith, —— Nev. ——, 176 Pacific 261, p. 265.

MINERAL CHARACTER OF LAND.

SURVEY—NOTATION AS TO MINERALS.

An official township survey with a notation that "there is some indication of mineral in this township," does not classify the particular tract as mineral in character, and they stand as prima facie non-mineral; but this is a presumption easily rebuttable, and the burden of proof is upon the person claiming it to be mineral.

Deer Creek Min. & Milling Co. v. Paris, 46 Land Decisions 268, p. 271.

ENTRY UNDER HOMESTEAD LAW.

An entry of land under the homestead law creates a vested interest and prevents any appropriation under the mining statutes unless the land in such homestead entry is shown to be of known mineral character before the issuance of the final certificate.

Deer Creek Min. & Milling Co. v. Paris, 45 Land Decisions 268, p. 272.

LOCATION OF CLAIM.

DIMENSIONS—LENGTH.

The United States statutes provide that a mining claim may equal but can not exceed 1,500 feet in length along the vein or lode.

Nelson v. Smith, ——, Nev. ——, 176 Pacific 261, p. 263.

LOCATION MUST EMBRACE DISCOVERY POINT.

The location of a lode mining claim based on discovery of a vein may be laid on a strip of open unappropriated, unsegregated public land 600 feet wide and 1,500 feet long in any direction along the supposed strike of the vein, if the strip embraces the point of discovery equidistant from the side lines.

Deer Creek Min. & Milling Co. v. Paris, 46 Land Decisions 268, p. 272.

MARKING LOCATION ON GROUND—LEGAL SUBDIVISIONS.

The statute of Washington (amendatory act of 1917, p. 599), authorizes any citizen finding precious minerals upon any of the State lands to apply to the commissioner of public lands for a lease of any amount not exceeding 80 acres for prospecting purposes, but requires the application to be made by legal subdivisions according to the public land surveys. The statute prior to this amendatory act required the applicant to post the usual location notice, set corner posts, and mark the boundaries as required by the United States mining statutes. The amendatory act requiring an application "by legal subdivisions according to the public land surveys" is in lieu of the location notice and the marking of the boundaries, and an applicant under this amendatory act is not required to show a location notice or the markings of the boundaries.

State v. Savidge, —— Wash. ——, 175 Pacific 568, p. 569.

INITIATING RIGHTS—ENTRY UPON EXISTING CLAIM.

Any competent locator has the right to initiate a lawful mining claim to unoccupied public land by a peaceful adverse entry upon it while it is in the possession of those who have no superior right to acquire title or hold possession.

Nelson v. Smith, —— Nev. ——, 176 Pacific 261, p. 264.

LOCATION ON EXCESS GROUND—KNOWLEDGE OF EXISTING CLAIM.

Where disputed ground of the public domain was open to location at the time a locator initiated his claim, it is immaterial to the validity of the location made that the locator knew of the boundaries of an existing claim or that the situs of such existing claim was known to the locator.

Nelson v. Smith, —— Nev. ——, 176 Pacific 261, p. 264.
See Walsh v. Henry, 38 Colo. 393, 88 Pacific 450.
Brown v. Oregon King Min. Co., 110 Federal 728.

EXCESSIVE LOCATION.

Where a mining location is excessive in length, if the error is innocently made, the claim is valid but the excess is void.

Nelson v. Smith, —— Nev. ——, 176 Pacific 261, p. 265.

NONMINERAL LAND INCLUDED.

The boundaries of a mining claim may include open nonmineral land as well as mineral land.

Deer Creek Min. & Milling Co. v. Paris, 45 Land Decisions 268, p. 272.

MARKING LOCATION.

OBJECT OF REQUIREMENT.

The object of the law in requiring a mining location to be distinctly marked on the ground so that its boundaries can be traced is a requirement admittedly designed to prevent the floating or swinging of claims.

Nelson v. Smith, —— Nev. ——, 176 Pacific 261, p. 264.
See United States Mining Statutes Annotated, 216.

MARKING—BOUNDARIES TRACEABLE.

The United States mining statutes require that a mining location must be distinctly marked on the ground so that its boundaries can be readily traced.

Nelson v. Smith, —— Nev. ——, 176 Pacific 261, p. 263.
See United States Mining Statutes Annotated, 218, 220.

BOUNDARIES OUTSIDE OF AUTHORIZED LIMITS—NOTICE.

With the discovery as the initial point the boundaries of a mining location must be so definite and certain that they can be readily traced and they must be within the limits authorized by law, as otherwise their purpose and object will be defeated. The area bounded by a location must be within the limits of the grant, and no one would be required to look outside such limits for the boundaries of a location. Boundaries beyond the maximum extent of a mining location would not impart notice and would be equivalent to no boundaries at all.

Nelson v. Smith, —— Nev. ——, 176 Pacific 261, p. 263.
See Hauswirth v. Butcher, 4 Mont. 299, 1 Pacific 714.
Leggatt v. Stewart, 5 Mont. 107, 2 Pacific 320.
United States Mining Statutes Annotated, 91.

DISCOVERY.

LANDS VALUABLE FOR MINERALS.

A valid mining location can be made only on lands some part of which are shown by a discovery to be valuable for minerals.

Deer Creek Min. & Milling Co. v. Paris, 46 Land Decisions 268, p. 272.

LOCATION OF DISCOVERY POINT.

The point of discovery of mineral may be anywhere within the strip of land appropriated without reference to the end lines, but it must be equidistant from the side lines.

Deer Creek Min. & Milling Co. v. Paris, 45 Land Decisions 268, p. 272.

ABANDONMENT.

ABANDONMENT BY PART OWNER—RELOCATION BY PART OWNER.

The locators of a mining claim sold and conveyed an interest therein to one person and the remaining interest to a corporation. Subsequently the corporation became defunct and abandoned all claim to the property. The other part owner did not abandon or otherwise dispose of his rights and subsequently together with other persons relocated the entire claim and performed all the annual assessment work. Such facts are sufficient to show ownership of the claim in the relocators.

Oroville International Salts Co. v. Rayburne, —— Wash.—— 176 Pacific 14, p. 15.

RELOCATION.

VALIDITY OF ORIGINAL LOCATION—ADMISSION.

The relocator of a mining claim by claiming a relocation of an existing claim thereby admits the validity of the original location.

Betsch v. Umphrey, 252 Federal 573, p. 574.

POSSESSORY RIGHTS.

VALID LOCATION AS BASIS.

The right to the possession of a mining claim comes only from a valid location, and if there is not a valid location there can be no possesssion under it. A mining location does not necessarily follow from possession, but possessions follows from location.

Nelson v. Smith, —— Nev. ——, 176 Pacific 261, p. 265.

DETERMINATION UNDER ACT OF CONGRESS.

The rights of parties to the possession of a mining claim must primarily be determined by the rules of law governing the right of possession of mining claims under the United States statutes.

Nelson v. Smith, —— Nev. ——, 176 Pacific 261, p. 263.

POSSESSION UNDER VALID LOCATION—PRIMA FACIE CASE.

A relocator of a mining claim in an action for possession against a successor to the original locator admitted the validity of the original location, and by setting forth an affidavit of the assessment work done by such successor of the original locator identified such assessment work and the possession of the successor of the original locator with the original location and thereby admitted his possession during the year that such assessment work was performed. The possession so admitted is presumed to have continued until shown to have been discontinued. The showing by the relocator that the successor of the original locator was in the quiet and undisputed possession of the premises during the year of the performance of the assessment work and under a valid location constitutes a prima facie case that can be overcome only by proof of abandonment or forfeiture and the acquisition of a better right or title by the relocator.

Betsch v. Umphrey, 252 Federal 573, p. 574.

POSSESSORY TITLE AND CONTROL.

A valid mineral location gives the locator possessory title to and control of the superficial area of the land within its boundaries so long as he complies with the statutes governing mining locations.

Deer Creek Min. & Milling Co. v. Paris, 45 Land Decisions 268, p. 272.

CONFLICT BETWEEN HOMESTEAD AND MINING LOCATION—SUPERIOR RIGHTS.

A homestead entry was duly made on public lands. Subsequently a prospector discovered minerals and located a mining claim that extended in part upon and over the prior homestead entry. The point of discovery of the mineral location was outside of the limits of the homestead tract. Under these facts the right of the homestead entryman is superior to that of the mineral locator where the proof failed to show that the mineral vein extended into the homestead tract and where it failed to show that the area in conflict was in fact mineral in character.

Deer Creek Min. & Milling Co. v. Paris, 45 Land Decisions 268, p. 274.

POSSESSORY ACTIONS.

ACTION TO QUIET TITLE—PLEADING—JUDGMENT ON PLEADINGS.

A defendant in an action to quiet title to a mining claim alleged in his answer that he was the owner in fee of the ground in controversy. A judgment could not be rendered upon the pleadings in such case on the ground that the answer did not allege that the defendant was the owner of the ground in controversy at the time of the commencement of the action and that the answer in fact admitted the averments of the complaint. It was the evident intent of the defendant to allege his title as of the date of the commencement of the suit. To justify a judgment on the pleadings, the pleading must be clearly bad and if there is any reasonable doubt as to its sufficiency such a judgment will not be rendered.

Betsch v. Umphrey, 252 Federal 573, p. 574.

ACTION TO QUIET TITLE—UNDIVIDED INTEREST—ESTOPPEL.

A person can not maintain an action to quiet his title to an undivided interest in a mining claim where it is shown that such person at the time he received and accepted a deed for such undivided interest knew that the grantor had prior thereto conveyed by deed his entire interest in the premises to a third person and with full knowledge of such fact accepted from such grantor one-half of the proceeds of the sale of the claim.

Moore v. Rochester Weaver Min. Co., —— Nevada ——, 174 Pacific 1017, p. 1021.

EJECTMENT—RECOVERY—PREVAILING RIGHT.

In possessory actions to recover unpatented mining claims, the ordinary rule in actions of ejectment to the effect that the plaintiff must recover on the strength of his own title and not on the weakness of his adversary's title does not apply. The rule is that in possessory actions for mining claims the better title prevails.

Oroville International Salts Co. v. Rayburne, —— Wash. ——, 176 Pacific 14, p. 15.

JURY TRIAL.

A cross complaint in an action involving the rights to a mining claim alleged a right of possession in the cross complainants and that they had been wrongfully deprived of such possession by the plaintiff. Under these allegations the cross complainants were entitled to a jury trial.

Oroville International Salts Co. v. Rayburne, —— Wash. ——, 176 Pacific 14, p. 15.

DESCRIPTION.

DESCRIPTION OF CLAIM—INTEREST CONVEYED.

The description of a mining claim in the granting clause of a conveyance was as follows: "1700 feet on the Chatauqua lode and also 400 feet on said Shelaw lode and also all the real estate of the grantor acquired and which may be acquired in a certain named county whether the same is particularly described herein or otherwise." The rule is that the general description prevails over a particular description where there is a clear intent to have the general description control. The grantor owned the entire 3,000 feet of the Chatauqua lode and by the conveyance there is a clear intent to have the general description control, and that intent should be given effect and the grantee receive a good and merchantable title to the entire 3,000 feet.

Sutton, Steele, etc., Min. Co. v. McCulloch, —— Colo., —— 174 Pacific 303, p. 304.

PLACER CLAIMS.

JOINT OWNERS—AUTHORITY OF ONE COOWNER.

One of several coowners of a placer claim can not bind the other coowners by giving a third person the privilege of going upon a part of the joint claim to make a location, or to make a location of a supposed excess in such placer claim, and an attempted location made under such circumstances is invalid as against the other coowners of the placer claim.

Adams v. Yukon Gold Co., 251 Federal 226, p. 229.

EXCESSIVE LOCATION—EFFECT—TRESPASS.

A location of a placer claim made in good faith by mistake containing an excessive area is not wholly void but is invalid only as to the excess. The claim owner may reject such portion of the excess as he may select, and until he is advised that there is an excess and has had a reasonable time in which to make his selection, his possession extends to the entire claim, and another person who goes upon it and attempts to make a location becomes a trespasser, and such attempted location is void for all purposes.

Adams v. Yukon Gold Co., 251 Federal 226, p. 228.

EXCESSIVE LOCATION—NOTICE TO OWNER OF EXCESS.

The coowners of a placer mining claim are entitled to the possession of the entire claim and if there is an excess to be advised of the fact to the end that they may within a reasonable time make a selection of what ground they intended to preserve as to their true claim. This right of possession is a valuable right and in the absence of a showing of substantial effort to give notice to all the coowners of record, notice to a part only is not a compliance with the spirit of the mining laws, which in their liberality have preserved the right of selection in case of an excessive location.

Adams v. Yukon Gold Co., 251 Federal 226, p. 229.

PATENTS.

APPLICATION FOR PATENT—JURISDICTION OF COURT PENDING PROCEEDINGS.

When an application for a patent for oil lands has been begun in the Land Office and countercharges of fraud have been made by the Government and are under investigation, pending action upon the application for patent, a court has no jurisdiction to determine the rights of the claimants in possession of the land as against the United States.

Devil's Den Consolidated Oil Co. v. United States, 251 Federal 548, p. 554.

DISMISSAL—APPLICATION—HARMLESS ERROR.

It may be conceded that the Land Department is without jurisdiction to order the cancellation of a mining location on an application for a patent; but the determination by the Land Department of the fact that the ground applied for was not mineral land in effect destroys every step taken by an applicant under the mining laws, and necessarily includes his mining location.

Cameron v. United States, 250 Federal 943, p. 946.
See Cameron v. Bass, —— Ariz.——, 158 Pacific 648.

OIL LOCATIONS.

APPLICATION FOR PATENT—JURISDICTION OF COURTS.

Where an application for a patent for oil claims has been made and is pending, and the right of the claimant to a patent has been challenged in the Land Department on the ground of fraud, a local court has no jurisdiction to entertain a suit on behalf of the United States to quiet title to the land embraced in such location and to appoint a receiver to take charge of the property as belonging to the United States.

Devil's Den Consolidated Oil Co. v. United States, 251 Federal 548, p. 554.

TRESPASS.

ATTEMPTED RELOCATION OF EXISTING CLAIM.

A person who enters upon a mining claim owned by several joint owners with the consent of one of such joint owners, for the purpose of relocating any part of such existing claim is a trespasser, and can not initiate any valid rights, although the original location was excessive, but no notice had been given the joint owners of such excess and no opportunity afforded to exclude any part of the claim because excessive.

Adams v. Yukon Gold Co., 251 Federal 226, p. 229.

SALE AND TRANSFER.

OPTION CONTRACT TO PURCHASE—POSSESSION.

An agreement by which the grantee was to have the privilege of purchasing a mining claim and was given the right to occupy and work the same under certain conditions is not a contract of purchase and sale, but an option to buy the claim coupled with the right of possession under certain conditions.

Nicholson v. Smith, —— Idaho ——, 174 Pacific 1008.
See Smith v. Beebe, —— Idaho ——, 174 Pacific 608.

OPTION CONTRACT OF SALE—EXPIRATION—RIGHTS OF PARTIES.

The owner of certain mining claims executed an option contract for the sale thereof to a prospective purchaser. The optionee proposed to operate the claims and to place thereon and therein certain fixtures. The option agreement provided that all such buildings, machinery, cars, rails, tools, and supplies, placed upon the property should become fixtures thereon, and a part thereof, and provided that if the option was not taken up, the machinery and fixtures should remain and become a part of the premises. The failure of the optionee to comply with the terms of the agreement and to meet the payments in the manner specified did not render the contract void. By his failure so to do his rights under the contract expired and the rights of the seller to repossess himself of the property and of the fixtures and machinery placed thereon accrued, and such fixtures and machinery as were placed upon the premises became the property of the original owner and seller.

Smith v. Beebe, —— Idaho ——, 174 Pacific 608, p. 610.

FRAUD—GRANTOR AS TRUSTEE.

An optionee held an option contract for the purchase of a certain mine at the fixed price of $11,000. He induced a mining company to purchase the mine for $15,000 and represented that that was the sum he had paid for the mine. The optionee had a secret agreement with the owner of the mine by which he should retain $4,000, the difference between the $11,000 he was to pay and the $15,000 for which he was selling the mine. The optionee under an arrangement with the mine owner and the purchaser took the title to the mine in his own name. Under such circumstances the original optionee, holding the title of the property, became the trustee of the purchaser and held the property in trust and under the facts could be compelled to transfer the property to the purchasing company.

Hope v. Berger Min. Co., — Cal. App. —, 174 Pacific 932, p. 933.

STATUTES RELATING TO MINING OPERATIONS.

CONSTRUCTION, VALIDITY AND EFFECT.

WORDS OMITTED FROM ENROLLED BILL—INSERTED IN PRINTED ACT.

The words included in brackets in section 2, act 175 (Acts of 1913) of Arkansas, were inadvertently omitted from the enrolled bill by the enrolling clerk, but they were in the original act on file in the office of the secretary of state, and were properly inserted in the published act by the secretary of state. With these words included, the act applies to all injuries inflicted by a corporation and is not confined to injuries in death cases only.

Athletic Min. & Smelting Co. v. Sharp, —— Ark. ——, 205 Southwestern 695, p. 697.

See Monetaire v. Columbus Rexall Consolidated Mines Co., —— Utah ——, 174. Pacific 172, p. 175.

CALIFORNIA MINERS' WAGES ACTS—VALIDITY AND CONSTRUCTION.

Section 3 of the California act of May 1, 1911, made any violation of the act a misdemeanor and imposed a fine upon conviction of not to exceed $500. This section was held unconstitutional. The act of August 8, 1915, provides a substitute for section 3 of the original act to the effect that where an employer fails to pay an employee within five days after his wages become due, the wages of an employee who is discharged or who quits work, as a penalty for such nonpayment shall continue at the same rate until paid, not exceeding 30 days.

Moore v. Indian Spring Channel Gold Min. Co., —— Cal. App. ——, 174 Pacific 378, p. 379.

See Crane, Matter of, 26 Cal. App. 22, 145 Pacific 733.

Commonwealth v. Reinecke Coal Min. Co., 117 Ky. 888, 79 Southwestern 287.

DIFFERENCE IN STATUTES AS TO PAYMENT OF WAGES.

The difference between the act of 1911 and the act of 1915 in relation to the payment of wages is that the act of 1911 declared a violation of its provisions to be a crime for which the violator was answerable to the State, but by the amendatory act of 1915 the employer must compensate the wage earner by way of penalty and the criminal provision is eliminated. This provision as to the penalty is not unlike in its operation the statute which authorizes a court to impose treble damages under certain circumstances and which is held to be remedial and not penal. This amendatory act falls within the police powers of the State and is constitutional and valid.

Moore v. Indian Spring Channel Gold Min. Co., —— Cal. App. ——, 174 Pacific 378, p. 379.

See Crane, Matter of, 26 Cal. App. 22, 145 Pacific 733.

Commonwealth v. Reinecke Coal Min. Co., 117 Ky. 888, 79 Southwestern 287.

EMINENT DOMAIN—LIBERAL CONSTRUCTION OF STATUTE.

A statute giving the right of eminent domain for a particular purpose must be given a liberal construction in furtherance of that purpose. This rule of liberal construction is applied to the statute of Utah which grants the right of eminent domain for the purpose of developing the mining industry and for the purpose of developing the mineral resources of the State, regardless of ownership.

Monetaire v. Columbus Rexall Consolidated Mines Co., —— Utah ——, 174 Pacific 172, p. 175.

STATUTE CHANGING THE RULE OF DAMAGES FOR TRESPASS—CONSTRUCTION.

The statute of Maryland (Code, art. 75, sec. 92) provides that in the absence of fraud, negligence, or wilful trespass the measure of damages for wrongful mining of minerals or coal is the value of the minerals or coal in the native state. It also provides that if a person furtively or in bad faith mines coal or minerals from the land of another he may be charged with the whole value of the coal or minerals taken and allowed no deduction in respect of his labor and expenses in getting them. It was for the legislature to determine the wisdom of this legislation, but, as it is contrary to a rule established after most thorough consideration and is liable to encourage trespass if not properly guarded it should not be extended beyond what was clearly the intention of the legislature.

Mt. Savage George's Creek Coal Co. v. Monahan, —— Md. ——, 104 Atlantic 480, p. 485.

FENCING ABANDONED SHAFTS—POLICE REGULATION.

The statute of Oklahoma requiring fences and danger signals at mine entrances where mining operations have been suspended is a police regulation enacted for the benefit of the public in general.

Whitehead Coal Min. Co. v. Pinkston, —— Okla. ——, 175 Pacific 365, p. 366.

DUTIES IMPOSED ON OPERATOR.

STATUTORY DUTY TO FURNISH SAFE PLACE—VENTILATION.

The statute of Iowa (Code Suppl., 1913, sec. 2488) requires a mine operator to provide and maintain an amount of ventilation of not less than 100 cubic feet of air per minute for each person employed in the mine and requires that the air shall be so circulated throughout the mine as to dilute and render harmless and expel all noxious and poisonous gases in the working parts of the mine. When the air in a mine has become charged with poisonous gas to an extent to materially injure a miner while employed therein, then the coal-mine operator has failed in his duty to so ventilate the working place as to render it harmless and he becomes liable for any consequent injury.

Gay v. Hocking Coal Co., —— Iowa, ——, 169 Northwestern 360, p. 362.

DUTY TO FURNISH SAFE PLACE.

The responsibility of a mining company operating a mine to give warning when blasts are to be fired arises under the general law requiring all employers to use ordinary care to furnish a reasonably safe place in which their employees are required to work.

United Verde Copper Co. v. Kuchn, 253 Federal 425, p. 426.

FAILURE TO VENTILATE MINE—LIABILITY FOR OCCUPATIONAL DISEASE.

A coal-mine operator who has refused to accept the terms of the workmen's compensation act is subject to other existing statutes that require a coal-mine operator to provide and maintain a specified amount of ventilation in his mine. The operator having rejected the provisions of the workmen's compensation act can not deny his liability for an occupational disease resulting from his violation of the statute in failing to provide the required ventilation on the ground that liability for occupational disease exists under the workmen's compensation act. A mine operator after rejecting the workmen's compensation act can not have the advantage or benefit of any of its provisions to limit or restrict his liability to respond in damages.

Gay v. Hocking Coal Co., —— Iowa ——, 196 Northwestern 360, p. 363.

SUSPENSIONS OF OPERATIONS—WARNING—DUTY.

The statute of Oklahoma provides that when mining operations are suspended the superintendent and mine foreman shall see that a danger signal is placed at the mine entrance and the entrance securely fenced off and a danger signal displayed. Under this statutory provision a mine operator owes a duty to all persons coming upon the premises by invitation to fence an entry to the mine and place warning signals of danger upon such fence, and failing to do so it is liable for resulting injuries.

Whitehead Coal Min. Co. v. Pinkston, —— Okla. ——, 175 Pacific 365, p. 366.

VIOLATION BY OPERATOR.

SHOT FIRING—FAILURE TO GIVE WARNING.

The revised statutes of Arizona (acts 1913, and Civil Code, p. 1365) provide that before firing charges in a mine, warning must be given in every direction from which access may be had to the place of blasting. There are no words in the statute designating the mining company or a mine operator as the person on whom the duty to give the warning falls. If the statute fails directly to place the duty to give the warning upon the mining company, nevertheless the State constitution makes the mine operator responsible for the neglect of such duty, and the same result is reached.

United Verde Copper Co. v. Kuehn, 253 Federal 425, p. 426.

FAILURE TO PERFORM STATUTORY DUTY—NEGLIGENCE PER SE.

The failure of a mine operator to perform a statutory duty imposed by a valid statute under the police power of the State for the protection of the public is negligence per se.

Whitehead Coal Min. Co. v. Pinkston, —— Okla. ——, 175 Pacific 365, p. 367.

FAILURE TO VENTILATE—NEGLIGENCE PER SE.

The statute of Iowa (Code Suppl., 1913, sec. 2488) places upon a mine operator the duty of ventilation and expressly states the extent of the ventilation required, and before a mine operator has discharged his duty, regardless of the contrivances employed or of the amount of ventilation, the gases in his mine must be rendered harmless by being diluted or expelled. A mine operator violating this statute is a wrongdoer and is ex necessitate negligent in the eyes of the law, and a miner within the protection of the statute injured by reason of such violation is entitled to recover damages.

Gay v. Hocking Coal Co., —— Iowa ——, 169 Northwestern 360, p. 362.
See Mosgrove v. Zibelman, 110 Iowa 172, 81 Northwestern 228.

FAILURE TO VENTILATE—INJURIES FROM IMPURE AIR—PLEADING AND PROOF.

A complaint in an action by a miner averred that the injuries complained of were due to impure air in the mine, such as is commonly termed in mining "bad air." Under these averments the proof and the plaintiff's right to recover are not to be limited to any particular kind of poisonous gases, but the charge is broad enough to entitle him to recover on proof that he was injured by the presence in the mine of noxious gases of any kind.

Gay v. Hocking Coal Co., —— Iowa ——, 169 Northwestern 360, p. 364.

FAILURE TO VENTILATE—OCCUPATIONAL DISEASE—LIABILITY.

A coal-mine operator is liable in damages to a miner contracting an occupational disease resulting from the failure of the mine operator to ventilate the mine as required by the statute. A wrongful injury which destroys or impairs the health of a miner is no less actionable than a wrong from which the miner sustains a bodily injury.

Gay v. Hocking Coal Co., —— Iowa ——, 169 Northwestern 360, p. 363.

ACTION FOR INJURIES—PLEADING—PROXIMATE CAUSE.

In an action by a miner for damages for disability resulting from what is termed "occupational disease" the plaintiff, in order to make a prima facie case, was not bound to plead or prove that he was not suffering from an occupational or other variety of disease except as such negation may be implied from proof that the injury complained of was the proximate result of the mine operator's failure to perform his statutory duty in the matter of the ventilation of the mine. If the mine operator failed to perform the statutory duty in respect to the ventilation of the mine, and if the complainant was thereby physically overcome or disabled to a degree causing him to suffer injury or loss, the mine operator's liability is not avoided or lessened by reason of the fact that the miner sustained no wound or bruise or other hurt of a traumatic character or origin.

Gay v. Hocking Coal Co., —— Iowa ——, 169 Northwestern 360, p. 363.

DUTIES IMPOSED ON MINE FOREMAN.

DANGEROUS PLACE—REPORT BY MINER—DUTY OF FOREMAN.

A miner on discovering a dangerous condition in his working place that could not be remedied or made safe by the use of props and timbers, immediately reported such dangerous condition to the mine foreman, as required by the Virginia statute. The foreman advised the miner that he would have the dangerous slate removed. After the slatemen had taken down the slate they thought was dangerous and fixed the place in working shape, the miner returned to his work and was injured by a fall of slate from the roof immediately behind him and from the place where the slatemen had removed some slate or rock. The determination by the mine foreman that the miner's working place did not require props but that the loose slate and rock should be taken down, and ordered the same done, was binding upon the mine operator, and the operator was liable for the negligence of the foreman in failing to have the miner's working place made safe.

Jewel Ridge Coal Corp. v. Keen, —— Va. ——, 96 Southeastern 767, p. 768.

VICE PRINCIPALS.

STATUTORY CREATION—NEGLIGENCE—LIABILITY.

The statute of Virginia (Acts 1912, p. 427, sec. 29) makes a mine foreman, boss, or fire boss and their assistants, when acting for a mine owner or operator, his vice principals. Under this statute negligence of slatemen directed by a mine foreman to take down and remove slate and to make a miner's working place safe is the negligence of a vice principal for which the mine operator is liable.

Jewel Ridge Coal Corp. v. Keen, —— Va. ——, 96 Southeastern 767, p. 768.

DUTIES IMPOSED ON MINER.

DUTY TO INSPECT.

The statute of Alabama (General Acts 1911, p. 513) provides that every workman employed in a mine shall examine his working place before beginning work, and after any stoppage of the work during a shift he shall repeat the examination. It is also made the duty of all miners to promptly inform the mine foreman or his assistant of any unsafe condition in his working place. This statute puts upon every miner the duty to exercise care to know the condition of his working place. The purpose of the statute is to put upon the miner the burden of examining for himself the places and conditions in his working place from which danger may be expected, and this includes the roof of the mine.

Seagle v. Stith Coal Co., —— Ala. ——, 79 Southern 301, p. 303.

FAILURE TO INSPECT WORKING PLACE—DANGEROUS APPEARANCE.

The statute of Alabama (General Acts 1911, p. 513) imposes upon every miner the duty of examining his working place and to report any unsafe conditions to the mine foreman or his assistant. If a miner by the exercise of that caution imposed upon him by the statute would have discovered the dangerous condition in the roof of the mine at his working place and nevertheless went under it and was injured, he can not recover. In such case the omission of the miner was negligence per se and was the proximate legal cause of his injury.

Seagle v. Stith Coal Co., —— Ala. ——, 79 Southern 301, p. 303.
See Woodward Iron Co. v. Wade, 192 Ala. 651, 68 Southern 1008.

DUTY OF MINER TO PROP WORKING PLACE—EXCEPTIONS.

The statute of Virginia (Acts 1912, p. 427) makes it the duty of each miner to prop and secure his mining place and prohibits a miner from working unless he has props and timbers sufficient to make his place secure. But this provision does not apply to a case where the threatened danger was not of such a character as to call for the use of props and where the miner pursuant to another provision of the statute was required to report the dangerous condition to the mine foreman.

Jewel Ridge Coal Corp. v. Keen, —— Va. ——, 96 Southeastern 767, p. 768.

RIGHT TO STATUTORY PROTECTION.

PERSONS WITHIN STATUTORY PROTECTION—PUBLIC.

The statute of Oklahoma requiring mine operators to fence the entrances to mines and erect danger signals when operations are suspended was intended for the protection of the public in general and applies to a person in the situation of an invitee or a licensee; and a failure to comply with the statute renders a mine operator liable for the death of an invitee or licensee resulting from the failure to comply with the statute.

Whitehead Coal Min. Co. v. Pinkston, —— Okla. ——, 175 Pacific 356, p. 366.

STATUTORY PROTECTION INVOKED BY PLEADING.

In an action by a miner for damages for injuries the complaint averred that the mine operator negligently furnished the complainant defective appliances with which to work and that the injuries complained of resulted from the use of the defective appliances. These averments are sufficient to invoke the provisions of the Indiana employers' liability act of 1911.

Jackson Hill Coal & Coke Co. v. Van Hentenryck, —— Ind. App. ——, 120 Northeastern 664, p. 667.

EMPLOYEE ON OUTSIDE TRAMWAYS.

Section 98 of the mining law of Alabama (General Acts 1911, p. 534) has no application to tramways or tram tracks that are employed outside of mines and entirely disconnected with any tramways or tram tracks in the mine.

Montevallo Min. Co. v. Underwood, —— Ala. ——, 79 Southern 453, p. 455.

FELLOW SERVANT RULE—DEFENSE ABROGATED.

FELLOW SERVANTS—DOCTRINE ABROGATED.

The constitution of Arizona (art. 18, sec. 4) abrogates the common law doctrine of fellow servants so far as it affects the liability of a mine operator for injuries to a miner resulting from acts or omissions of any other miner.

United Verde Copper Co. v. Kuchn, 253 Federal 425, p. 426.

LIABILITY NOT AVOIDED BY CONTRACT.

Section 36, article 9 of the constitution of the State of Oklahoma prevents a coal-mine operator from entering into a contract with a miner by the terms of which he is to relieve himself from liability for injuries resulting from the negligent or careless acts of a fellow servant of the miner.

Creek Coal Min. Co. v. Paprotta, —— Okla. ——, 175 Pacific 235, p. 237.

SLATEMEN NOT FELLOW SERVANTS OF MINER.

Under the statute of Virginia making mine foremen, bosses, or fire bosses, and their assistants, vice principals, slatemen ordered by a mine foreman to go to a miner's working place and take down the slate and make the place safe, are not fellow servants of the miner and their negligence in failing to make the place safe will not defeat a recovery by the miner for damages for injuries caused by such negligence.

Jewel Ridge Coal Corp. v. Keen, —— Va. ——, 96 Southeastern 767, p. 768.

EFFECT ON CONTRIBUTORY NEGLIGENCE.

DEFENSE.

Under the provisions of the Indiana employer's liability act of 1911, contributory negligence of an injured miner, when not affirmatively shown in the complaint, is a matter of defense.

Jackson Hill Coal & Coke Co. v. Van Hentenryck, —— Ind. App. ——, 120 Northeastern 664, p. 667.

MINER'S WORKING PLACE—SAFETY.

A miner on discovering a dangerous condition in his working place immediately reported the fact to the mine foreman, as required by the Virginia mining statute. The foreman examined the miner's working place and directed the slatemen to take down the overhanging slate and make the place safe. After completing their work, they informed the miner that the place was ready for him and he thereupon resumed his work and was injured by a fall of slate from the roof. The miner under the statute can not be charged with contributory negligence in returning and beginning work in his place after it was reported to be in proper condition by the slatemen.

Jewel Ridge Coal Corp. v. Keen, —— Va. ——, 96 Southeastern 767, p. 768.
See Bernes v. Gaston Coal Co., 27 W. Va. 285.

EFFECT ON ASSUMPTION OF RISK.

DEFENSE.

Under the provisions of the Indiana employers' liability act of 1911, the assumption of risk by an injured miner when not affirmatively shown in the complaint, is a matter of defense.

Jackson Hill Coal & Coke Co. v. Van Hentenryck, —— Ind. App. ——, 129 Northeastern 664, p. 667.

MINERS' WAGES.

PAYMENT COMPELLED.

The California statute of May 1, 1911 (p. 1268), and the amendment of April 28, 1915 (p. 299), requiring the payment of miners' wages once in each month imposes no unreasonable burden upon the employer as operating as it does in the future and disturbing no vested right, the employer must and it is but fair that he should make provision to pay his employee before hiring him, and failing in this, he should pay the penalty.

Moore v. Indian Spring Channel Gold Min. Co., —— Cal. App. ——, 174 Pacific 378, p. 381.

RECOVERY OF WAGES AND PENALTY.

The statute of May 1, 1911 (p. 1268), as amended by the act of August 8, 1915, (p. 299), applies to mine operators as employers and to miners as employees. Miners who had worked for a mine operator for several months at a daily wage received their pay at the end of the month regularly as agreed upon. The mine finally shut down and the miners were discharged and the mine operator refused to pay the last month's wages. Under the amendatory act of 1915, a discharged miner could sue and recover not only the wages due but the penalty imposed by the amendatory act.

Moore v. Indian Spring Channel Gold Min. Co., —— Cal. App. ——, 174 Pacific 378, p. 381.

MINER'S WAGES—EMPLOYEE QUITTING WORK—RECOVERY.

The statute of California of May 1, 1911, as amended by the act of August 8, 1915, provides that when an employee is discharged by his employer his wages earned and unpaid shall become due immediately. If the employment is not for a definite period and the employee quits his employment, the act gives the employer five days to pay the wages earned and unpaid. There is nothing unreasonable in this provision, for the right of the employee to quit work, where there is no contract for a definite period is as undeniable as the right of the employer to discharge the employee. The act does not violate any of the provisions of either the State or the Federal constitution.

Moore v. Indian Spring Channel Gold Min. Co., —— Cal. App. ——, 174 Pacific 378, p. 381.

WRONGFUL DEATH.

SURVIVAL OF ACTION.

The cause of action for pain, suffering, and medical expenses arising from a wrongful injury survives under the statute (Rev. Laws, 1910, sec. 5281) to the personal representative when the injury results in the death of an employee, and the recovery becomes a part of his estate and is subject to the claims of creditors.

Lahoma Oil Co. v. State Industrial Commission, —— Okla. ——, 175 Pacific 836, p. 837.

BENEFICIARIES—RIGHT TO SUE—PLEADING.

In an action for damages for a wrongful death the complaint is sufficient to show a reasonable expectancy on the part of the father for continued support on behalf of the deceased and that he sustained a loss by reason of the death where it averred that the deceased was earning $50 a month and was living with his father and spending his earnings in the support of his father and sister.

Whitehead Coal Min. Co. v. Pinkston, —— Okla. ——, 175 Pacific 365, p. 367.
See McGarvie v. Frontenac Coal Co., —— Kans. ——, 175 Pacific 375.

EFFECT OF WORKMEN'S COMPENSATION ACT.

By the terms of the workmen's compensation act of Oklahoma the amount of compensation for each injury is limited and based upon the amount of the weekly wage. The provision excepting injuries resulting in death was doubtless incorporated so as to make the act in harmony with the constitutional provision under which the amount recoverable can not be limited if death results from an injury. The death of an injured employee terminates his relation with the employer and the occasion for making compensation in lieu of wages comes to an end and the the workmen's compensations act has nothing to do with the statutory right of action for wrongful death.

Lahoma Oil Co. v. State Industrial Commission, —— Okla. ——, 175 Pacific 836, p. 837.

RECOVERY UNLIMITED.

The constitution of Oklahoma (art. 23, sec. 7) provides that the right of action to recover damages for injuries resulting in death shall never be abrogated and the amount recoverable shall not be subject to any statutory limitation. Because of this constitutional provision the workmen's compensation act of Oklahoma does not control or otherwise affect a right of action for wrongful death.

Lahoma Oil Co. v. State Industrial Commission, —— Okla. ——, 175 Pacific 836, p. 837.

DEPENDENCY—PROOF INSUFFICIENT.

Where it appeared in an action by the father and mother as beneficiaries for damages for the death of a son who was a coal miner, the evidence was insufficient to show a partial dependency where there was no contribution to the support of the parents and where both admitted that they did not know whether the mother's receipt of money from the son ever exceeded a fair estimate for his board and lodging.

McGarvie v. Frontenac Coal Co., —— Kans. ——, 175 Pacific 375, p. 376.

SUIT IN FOREIGN STATE.

The statute of Massachusetts gives a right of action in favor of the widow and children or the next of kin of a person killed by the wrongful act of another. A citizen of New York was killed in Massachusetts by the agents of the Standard Oil Company. The administrator of the decedent may sue and maintain an action in the courts of New York under the Massachusetts statute and recover for the benefit of the next of kin.

Loucks v. Standard Oil Co., —— N. Y. ——, 120 Northeastern 198.

STATUTE OF FOREIGN STATE—ENFORCING IN DOMESTIC COURT.

The statute of Massachusetts as amended by the laws of 1907 (Ch. 375) makes a person or corporation causing the death of another liable in damages in a sum of not less than $500 nor more than $10,000 for the use of the widow and children, or of the next of kin, of the deceased. This statute is not penal in an international sense. An offender is punished, but the purpose of the punishment is reparation to those aggrieved by his offense. The damages may be compensatory or punitive according to the statutory scheme, but in either case the complainants have a grievance above and beyond any that belongs to them as members of the body politic in that they sue to redress an outrage peculiar to themselves. he statute is penal in one element only in that the damages are punitive, but the punishment of the wrongdoer is not designed as an atonement for a crime, but it is the solace to the individual who has suffered a private loss. The executor or administrator who sues under this statute is not the champion of the peace, order, and justice of the Commonwealth of Massachusetts, but he is the representative of the outraged family and vindicates a private right. The statute may be enforced in an action in the courts of New York.

Loucks v. Standard Oil Co., —— N. Y. ——, 120 Northeastern 198.

EMPLOYERS' LIABILITY ACT.

CONSTITUTIONALITY.

The first employers' liability act of West Virginia was held unconstitutional because extended to cover all work done by employees of an interstate character, a large part of which work could not be upon interstate commerce or directly in furtherance thereof. The present liability act (Code, sec. 708) eliminated that difficulty and is constitutional.

Suttle *v.* Hope Nat. Gas Co., —— W. Va. ——, 97 Southeastern 429, p. 432.

See First Employers' Liability Cases, 207 United States 463, 28 Supreme Ct. Rep. 141.

Second Employers' Liability Cases, 223 United States 1, 32 Supreme Ct. Rep. 169.

CONSTRUCTION—ACCIDENTS WITHIN 30 DAYS—APPLICATION.

Subsection 3 of act No. 20 of 1914, the Louisiana workmen's compensation act, declares that every contract of hiring made subsequent to the time provided for the act to take effect between an employer and employee in all hazardous employments shall be presumed to have been made subject to the provisions of the act, unless there be as a part of the contract, an express statement in writing, not less than 30 days prior to the accident, either in the contract itself or by written notice by either party to the other that the provisions of the act are not intended to apply; and in the absence of such an agreement it shall be presumed that the parties have elected to be subject to the provisions of the act. Under this provision an accident occurring within 30 days after a contract of employment in the absence of the agreement required is within the provisions of the employers' liability act.

Philps v. Guy Drilling Co., 143 La. ——, 79 Southern 549, p. 550.

Overruling, Woodruff v. Producers' Oil Co., 142 La. ——, 76 Southern 803.

CONSTRUCTION—RECOVERY BY DEPENDENT—APPLICATION OF ACT.

The mother of a deceased son, whose death was caused by an oil drilling company, brought an action against the drilling company for damages for tort, or in the alternative for compensation under the employers' liability act of Louisiana for the death of the son. The evidence showed that the accident resulting in the death occurred within the 30 days after the employment, that there was no agreement between the employer and employee that the act should not apply. Under the facts shown the right to compensation was within the Louisiana act No. 20, 1914, and a judgment refusing a demand for damages for the tort was properly entered.

Philps v. Guy Drilling Co., 143 La. ——, 79 Southern 549, p. 552.

EXCLUSIVENESS OF REMEDY.

Section 34 of the workmen's compensation act of Louisiana (act No. 20, 1914) declares that the rights and remedies granted an employee on account of a personal injury for which he is entitled to compensation under the act shall be exclusive of all other rights and remedies available to himself or his personal representatives or dependents. This provision makes the right to compensation exclusive both as to the employee and his dependents.

Philps v. Guy Drilling Co., 143 La. ——, 79 Southern 549, p. 552.

CONSTRUCTION—LIMITING REMEDIES.

The title of the employers' liability act of Louisiana (Act No. 20, 1914) expresses plainly enough the object and purpose of limiting the rights and remedies of an injured employee and the rights and remedies of the dependents or representatives of a deceased employee to the schedule of compensation established and to the liability of the employer as prescribed by the statute. The term "to prescribe" in the sense used in the statute means to lay down authoritatively as a guide or rule of action and an act prescribing the liability of an employer to make compensation for injuries received by an employee is an act limiting the rights and remedies of an employee or his representatives for injuries received by him. The expressions in the title "establishing a schedule of compensation," and "regulating procedure for the determination of liability and compensation," and "providing for payments of compensation," indicate the object or purpose of establishing the rights and remedies of one to whom compensation may be due and of thereby excluding all other rights and remedies.

Philps v. Guy Drilling Co., 143 La. ——, 79 Southern 549, p. 550.

ACTION BY DEPENDENT—SUFFICIENCY OF PROOF—PROCEDURE—REHEARING.

In an action by a dependent mother under the Louisiana employers' liability act an order for compensation can not be entered where the evidence is not so certain as to the amount of the average weekly wage her deceased son had earned nor as to the amount he contributed to her support, that the court could determine what compensation should be allowed. But the spirit, if not the letter, of the act should have permitted a rehearing of the case with permission to introduce more evidence instead of rendering a nonsuit. The act expressly declares that the judge shall not be bound by the usual common law or statutory rules of evidence nor by technical or formal rules of procedure, but he shall decide the merits of the controversy as equitably, summarily, and simply as may be.

Philps v. Guy Drilling Co., 143 La. ——, 79 Southern 549, p. 552.

ACTION FOR DAMAGES — ALTERNATIVE DEMAND FOR COMPENSATION.

In an action by a mother for damages for the death of her son on the ground of her dependency, a demand for compensation under the Louisiana Employers' Liability act was not waived, and it should not be dismissed merely because it was urged in the alternative and only in the event the court should hold the plaintiff was not entitled to damages under the Civil Code.

Philps v. Guy Drilling Co., 143 La. ——, 79 Southern 549, p. 552.

PROOF OF NEGLIGENCE.

The fact that the employers' liability act of Alabama does not contain a clause to the effect that an employee should not be entitled to compensation unless the injury resulted from some impropriety or defect in the rules, by laws, or instructions, does not have the effect of dispensing with the general rule that proof of negligence in respect to the subject matter is a general precedent to a recovery.

Seagle v. Stith Coal Co., —— Ala. ——, 79 Southern 301, p. 302.

NEGLIGENCE—FAILURE TO PROMULGATE RULES.

The Legislature of Alabama omitted from the employers' liability act the provision that an employee shall not be entitled to compensation unless the injuries complained of result from some impropriety or defects in the rules, by-laws, or instructions. The legislature evidently intended that no liability can be predicated unless an employer is shown to be culpable either in promulgating a rule in question or in failing to promulgate a rule governing certain conditions.

Seagle v. Stith Coal Co., —— Ala. ——, 79 Southern 301, p. 302.

NEGLIGENT INSTRUCTIONS TO WORKMAN — LIABILITY OF EMPLOYER.

In order to render an employer, a mine operator, liable on the ground of improper or negligent instructions to a delegate under the Alabama employers' liability act, the employer must have authorized the delegate to give some definite instructions as specified by him, or generally to give some instructions; and though the instructions were formed by the delegate himself in pursuance of such authorization, they must come within the terms of the act. Prior to this act an employer would not have been liable for improper instructions from a delegate as the impropriety in the instruction could not have been attributable to a personal breach of duty on the part of the delegate unless there had been negligence in the choice of the delegate. Where an employer has himself definitely specified the instructions to be given by the delegate the latter would be merely the mouthpiece of the employer for conveying the improper instruction and the negligence would be personal to the employer for which he is responsible.

Seagle v. Stith Coal Co., ——, Ala. ——, 79 Southern 301, p. 302.

EMPLOYEE OBEYING INSTRUCTION.

In an action under the Alabama employers' liability act by an employee for damages for injuries resulting from his obedience to improper or negligent instructions of another employee, the burden is on the employee to show that the person giving the improper or negligent instruction was delegated so to do by the employer.

Seagle v. Stith Coal Co., —— Ala. —— 79 Southern 301, p. 303.

APPLICATION TO EMPLOYEES ENGAGED IN INTRASTATE COMMERCE.

A natural gas company was engaged in transporting natural gas from West Virginia into Ohio through trunk pipe-lines and there sold to another company for distribution to its patrons and consumers in that State. The employers' liability act of West Virginia (Code, sec. 708) applies unconditionally to the employees of such natural gas company whose work was wholly intrastate and clearly separable and distinguishable from work in interstate commerce, although the same section, with respect to employees who were engaged partly in intra and partly in interstate commerce provides that the act shall only apply upon the condition that the employer and such employees voluntarily accept the provisions of the act in a stated manner.

Suttle v. Hope Nat. Gas Co., —— W. Va.——, 97 Southeastern 429, p. 431.

CLASSES OF EMPLOYEES—INTERSTATE AND INTRASTATE COMMERCE—APPLICATION OF ACT.

The employers' liability act of West Virginia in its application to employees with reference to the work being done contemplates three classes: (1) those working wholly upon intrastate commerce, (2) those working wholly upon interstate commerce, (3) those working partly upon intrastate and partly upon interstate commerce. No difficulty appears as to the first and second classes, as one field belongs exclusively to the State and the other primarily to Congress. As to the third class Congress could not provide for them except as to their interstate work and has not provided for them to any extent except as to employees of carriers by railroad, so the State could cover all intrastate work and under its permissive power could provide for all interstate work not covered by federal legislation. Section 52 of the act was made to fit that condition. The first part of the section is limited to the application of the act where the employer is engaged in both interstate and intrastate commerce to the cases where the intrastate work is clearly separable and distinguishable from the interstate. The second part of the second deals with employees working partly upon interstate and partly upon intrastate commerce and to them the act applies only by voluntary acceptance. But this acceptance is not required where the employees are engaged in work clearly separable and distinguishable from interstate commerce.

Suttle v. Hope Nat. Gas Co., —— W. Va. ——, 97 Southeastern 429, p. 432.

WORKMEN'S COMPENSATION ACT.

CONSTRUCTION AND APPLICATION.

The workmen's compensation act of Oklahoma must be construed to be in harmony with the provisions of the constitution and the various sections of the statutes and laws of the State so as to give meaning and effect to all, if such construction is possible without doing violence to the language and spirit of the act.

Lahoma Oil Co. v. State Industrial Commission, —— Okla. ——, 175 Pacific 836, p. 837.

See Matthews v. Rucker, —— Okla. ——, 170 Pacific 492.

Roma Oil Co. v. Long, ——Okla. ——, 173 Pacific 957.

CONSTRUCTION—OBJECT AND INTENT.

The object of all workmen's compensation acts is benificent and bountiful and their provisions broad and generous. The intention and design of such enactments are to establish a mode for the prompt redress of grievances and secure restitution commensurate with the loss of the service by those upon whom depend for support and maintenance the persons named as beneficiaries. Strict rules are not to obtain to the detriment of a claimant in violation of this wholesome purpose.

Poccardi v. Ott, —— W. Va.——, 96 Southeastern 790, p. 791.

REMEDIAL—LIBERAL CONSTRUCTION.

The workmen's compensation act of Colorado is highly remedial and beneficent in purpose and is to be liberally construed. A court should not adopt such an interpretation of a statute as would produce absurd, unreasonable, unjust, or oppressive results if such interpretation can be avoided.

Karoly v. Industrial Commission, —— Colo. ——, 176 Pacific 284, p. 285.

See Employers' Mutual Ins. Co. v. Industrial Commission, —— Colo. ——, 176 Pacific 314, p. 315.

ALASKA ACT—RIGHTS AND REMEDIES EXCLUSIVE.

The workmen's compensation act of Alaska supersedes the common law and by its comprehensive provisions covers the field of liability in an action by a miner for damages for injuries received while working in a mine. The remedy provided for the omission of duty on the part of a mine operator is different from that conferred by the common law and the plaintiff's right of action is statutory and the rights and limitations of the parties are fixed by the act.

Martin v. Kennecott Copper Corp., 252 Federal 207, p. 208.

ACTION UNDER WORKMEN'S COMPENSATION ACT EXCLUSIVE.

The workmen's compensation act of Alaska supersedes the common law in that territory and a common law action can not be maintained against a mine operator by a miner for damages for injuries received while working in a mine. The sole remedy is given by the workmen's compensation act of Alaska.

Martin v. Kennecott Copper Corp., 252 Federal 207, p. 208.

LAW AS PART OF CONTRACT.

The provisions of the workmen's compensation act of Alaska enter into and become part of the contract of employment between a mine operator and a miner as fully as if written out in such contract.

Martin v. Kennecott Copper Corp., 252 Federal 207, p. 208.

MINE OPERATOR REJECTING ACT—LIABILITY—DEFENSES.

A coal-mine operator who rejected the provisions of the Iowa workmen's compensation act is liable in the same manner and to the same extent as he would have been had the compensation act never been passed, except in an action by a miner for personal injuries arising out of and in the course of his employment, it will be presumed that the injury was caused by the employer's negligence and certain common law defenses will not be available to him.

Gay v. Hocking Coal Co., —— Iowa ——, 169 Northwestern 360, p. 362.

FAILURE TO ACCEPT—EFFECT.

A complaint in an action against an oil-well driller for damages for injuries averred that when the injury was inflicted the oil-well driller was an employer entitled to qualify under the provisions of the workmen's compensation act of West Virginia, (Acts 1915, ch. 9; Acts Extra Session 1915, ch. 1), but had failed negligently to accept the provisions of that act. An employer who is entitled to qualify under the provisions of the workmen's compensation act and fails to do so is deprived of the protection it affords and is subject to the burdens it imposes.

Long v. Foley, —— W. Va. ——, 96 Southeastern 794, p. 795.

ACCIDENTAL INJURY—MEANING.

An injury is accidental within the meaning of the Illinois workmen's compensation act when it occurs in the course of the employment unexpectedly and without affirmative act or design of the employee.

Matthiessen, etc., Zinc Co. v. Industrial Board, —— Ill. ——, 120 Northeastern 249, p. 251.

ACCIDENTS AND ACCIDENTAL INJURY—DEFINITION.

The word "accident" in the Illinois workmen's compensation act is not a technical legal term that has a clearly defined meaning, and no legal definition has ever been given which has been found to be exact and comprehensive as applied to all circumstances. Anything that happens without design is commonly called an accident and at least in the popular acceptance of the word any event which is unforeseen and not expected to the person to whom it happens is included in the term. The meaning of the word as used in the Illinois workmen's compensation act is necessarily influenced by the various provisions of the act and the purpose of its enactment and can not be determined alone from any definition found in a dictionary.

Matthiessen, etc., Zinc Co. v. Industrial Board, —— Ill.——, 120 Northeastern 249, p. 251.

ACCIDENTS AND ACCIDENTAL INJURY—MEANING.

The words "accidents" and "accidental injury" imply and the provisions for notice to the employer within 30 days after an accident and his report to the industrial board of accidental injuries show, that an injury to be accidental or the result of an accident must be traceable to a definite time, place, and cause. If there is a definite time, place, and cause, and the injury occurs in the course of the employment, the injury is accidental within the meaning of the act and the obligation to provide and pay compensation arises.

Matthiessen, etc., Zinc Co., v. Industrial Board, —— Ill. ——, 120 Northeastern 249, p. 251.

"ACCIDENT" AND "ACCIDENTAL INJURY"—INCLUSIVENESS OF ACT.

The words "accident" and "accidental injury" were meant to include every injury suffered in the course of employment for which there was an existing right of action at the time the act was passed and to extend the liability of the employer to make compensation for injuries for which he was not previously liable and to limit the compensation to be paid therefor.

Matthiessen, etc., Zinc Co. v. Industrial Board, —— Ill. ——, 120 Northeastern 249, p. 251.

ACCIDENT—DISABILITY FROM OCCUPATIONAL DISEASE.

A disability caused from an occupational disease incident to the business of smelting zinc, or arising from that source, is not to be regarded as an accident within the meaning of the Illinois workmen's compensation act because such a disease has its inception in the occupation and develops over a long period of time from the nature of the occupation and not from any unusual or unforeseen cause of event. There is statutory authority for the recovery of damages if such injury resulted from the employer's violation of a statute, and the remedy in such case is not confined to the compensation provided by the workmen's compensation act.

Matthiessen, etc., Zinc Co. v. Industrial Board, —— Ill. ——, 120 Northeastern 249, p. 251.

ACCIDENTAL INJURY—ARSENICAL POISONING.

An employee in a lead and zinc smelter worked for a period of fifteen years as a fireman at the furnaces in the smelter. On the evening of the last day's work he was seized with cramps throughout his arms, legs, stomach, and bowels, and grew steadily worse and died within ten days. On petition his personal representative was entitled to an award on the ground that his death was due to acute arsenical poisoning not of a chronic nature, but his physical condition was such as to make him susceptible to arsenical poisoning in such degree as to bring on his fatal injury and death, and this was an accident within the meaning of the workmen's compensation act of Illinois.

Matthiessen, etc., Zinc Co. v. Industrial Board, —— Ill. ——, 120 Northeastern 249, p. 250.

COURSE OF EMPLOYMENT—ACCIDENT—NEGLIGENCE.

A miner had been working in the gaseous section of a mine before it was closed off and had left his mining machines and other tools in that part of the mine. Two months later while engaged in another part of the mine some considerable distance from his proper place he left his working place and went into the gaseous part of the mine, where he was told not to go and where danger signals were properly placed, to get his mining machines and tools for work. While so doing, and while in the gaseous part of the mine he was overcome with gas and died from its effects. Under these circumstances the miner died from an accident which occurred in the course of his employment within the meaning of the Pennsylvania workmen's compensation act of 1915 (Pa. Laws 1915, p. 736). The fact that he disobeyed the orders though fully understood and appreciated by him would be nothing more than a negligent act on his part and negligence on the part of an injured employee does not bar his right to compensation under the workmen's compensation act.

Gurski v. Susquehanna Coal Co., —— Pa. ——, 104 Atlantic 801, p. 802.

DETERMINATION OF EXTENT OF DISABILITY—COMPENSATION.

In determining the amount of compensation to be paid an injured miner the industrial commission must first determine to what extent the complainant was disabled, as that is the basis upon which he is to be compensated and without such determination he could receive no compensation.

Employers' Mutual Ins. Co. v. Industrial Commission, —— Colo. ——, 176 Pacific 314, p. 315.

COMPENSATION NOT DEPENDENT UPON WRONG OR NEGLIGENCE.

The compensation to be paid to an injured employee under the Oklahoma workmen's compensation act does not depend upon whether the injury was wrongfully caused by the negligence of the employer. The compensation to be paid when an accidental injury is sustained arising out of and in the course of the employment without regard to the fault as a cause of such injury, except where the injury is sustained by the wilful intention of the injured employee, or where the injury results directly from the wilful failure of the injured employee to use a guard or protection furnished for his use. The act recognizes that a personal injury suffered by an employee arising out of and in the course of the employment is an incident of the business in which he is employed and as a matter of justice the resulting burden should be borne by the business without regard to the question of fault on the part of the employer or of the employee.

Lahoma Oil Co. v. State Industrial Commission, —— Okla. ——, 175 Pacific 836, p. 837.

LUMP-SUM SETTLEMENT.

The theory of the legislature in enacting section 57 of the workmen's compensation act of Colorado as to payment in gross for permanent total disability was that cases would arise in which the condition of the injured employee would be so marked that there would be little reason to anticipate improvement in earning capacity and the circumstances would be such as would warrant the court in giving judgment for a lump sum available at once rather than for periodical payments as in an award.

Karoly v. Industrial Commission, —— Colo. ——, 176 Pacific 284, p. 285.

LUMP-SUM SETTLEMENT—DETERMINATION.

The workmen's compensation act of Colorado (sec. 57) provides that when payment in gross is ordered the industrial commission shall fix the gross amount to be paid based on the present worth of partial payments. From this provision the commission can easily and accurately ascertain the amount of the gross payment in cases where the period for which partial payments are to be paid is fixed at a certain definite number of weeks. There is nothing in the clause which prohibits or prevents the commission from fixing a gross amount in cases where the periodical payments are to continue during the life of an injured employee. The exact number of such partial payments in the future can not be accurately ascertained, but the commission in the light of all the facts may make a reasonable estimate as to the probable number of such partial payments and the probable duration of the claimant's life. The statute by necessary implication empowers the commission to do this and to determine "the present worth of partial payments," whether the exact number of such payments can be ascertained or not.

Karoly v. Indistrial Commission, —— Colo. ——, 176 Pacific 284, p. 286.

See Employers Mutual Ins. Co. v. Industrial Commission, —— Colo. ——, 176 Pacific 314, p. 316.

DENIAL OF LUMP-SUM PAYMENT—PREJUDICIAL ERROR.

An injured miner filed his petition under the Colorado workmen's compensation act for payment in a lump sum on the ground of permanent total disability. The industrial commission and the court following its finding denied the claim on the ground that section 57 of the workmen's compensation act (Session Laws, 1915) does not apply to cases of total permanent disability. By this ruling of the industrial commission and the court the miner was prejudiced by the error even though the commission also denied his application for a lump-sum settlement on the ground that it would not be for the best interest of the parties concerned.

Karoly v. Industrial Commission, —— Colo. ——, 176 Pacific 284, p. 285.

PAYMENT OF LUMP SUM.

The payment of a lump sum to an injured employee whose disability is only partial or temporary might be difficult to determine, but a miner who is permanently and totally disabled is as much entitled to the allowance of a gross sum as is any other injured workman. The workmen's compensation act of Colorado should be construed, if possible, so as to apply to cases of permanent total disability, since such construction would prevent oppressive results and at the same time be in accord with the policy and purpose of workmen's compensation legislation.

Karoly v. Industrial Commission, —— Colo. ——, 176 Pacific 284, p. 286.

APPLICATION TO PERMANENT TOTAL DISABILITY—PAYMENT IN GROSS.

Section 57 of the workmen's compensation act of Colorado (Session Laws, 1915) provides that in six months from the date of an injury the commission may order payment in gross or otherwise as it may determine to be for the best interests of the parties concerned. It is made the duty of the commission to fix the gross amount to be paid, based on the present worth of partial payments, considering interest at 4 per cent. This section applies to cases of total permanent disability and gives the commission the power to order payment in gross in such cases.

Karoly v. Industrial Commission, —— Colo. ——, 176 Pacific 284, p. 285.

TOTAL PERMANENT DISABILITY—WEEKLY ALLOWANCE—LUMP-SUM SETTLEMENT.

A miner injured while working in a mine presented a petition to the Colorado Industrial Commission alleging permanent total disability and asking the commission to order that he be paid a lump sum. The commission found that he was suffering a permanent total disability and awarded him $8 per week and denied him a lump-sum settlement. If, as is possible and also probable, according to the petition of the injured miner, he will be compelled to appeal to the public for aid, then one of the objects of the compensation act will be defeated and the burden of bearing the economic loss resulting from the injuries that should be borne by the industry in which the injury occurred will instead be cast upon society as a whole. The intention of the act is to provide compensation for injured workmen, and circumstances may occur where the compensation would be more just, equitable, appropriate, and beneficial if paid in a lump sum than if paid in small weekly installments.

Karoly v. Industrial Commission, —— Colo. ——, 176 Pacific 284, p. 286.
See Employers Mutual Ins. Co. v. Industrial Commission, —— Colo. ——, 176 Pacific 314, p. 315.

COMPENSATION—MAXIMUM AMOUNT—LIFE EXPECTANCY.

When the Colorado Industrial Commission determines the extent of the disability of a claimant and the condition is determined to be permanent, it is permissible for the commission to ascertain and consider the life expectancy of the claimant as an aid in fixing the aggregate amount due him under the statute. As the statute provides a maximum amount which a claimant may receive for permanent total disability, his life expectancy is at least a proper element for consideration in determining whether he is entitled to the full maximum amount or a less sum.

Employers' Mutual Ins. Co. v. Industrial Commission, —— Colo. ——, 176 Pacific 314, p. 315.

WEEKLY PAYMENTS—METHODS OF ASCERTAINING.

The workmen's compensation act of Colorado limits the amount of weekly allowances to not more than $8 per week, and aside from this there is no restriction upon the industrial commission as to weekly allowances to be paid injured claimants. The act provides that after six months from the date of injury payments may be ordered to be made in such manner as the commission may determine to be for the best interest of the parties concerned. The fact that an increase in weekly payments operates to the detriment of an indemnity company on the ground that the longer the time given to complete the payment the more likelihood there will be that the claimant will die and thus relieve the insurer of further liability. But this is neither a legal nor logical reason for denying the right of the commission to use its discretion in the matter of fixing the size of the weekly installments after the lapse of the first six months after the injury.

Employers' Mutual Ins. Co. v. Industrial Commission, —— Colo. ——, 176 Pacific 314, p. 315.

COMPENSATION AWARDED—SUBSEQUENT DEATH—EFFECT.

An injured employee of an oil company secured a determination and an award for permanent disability, under the Oklahoma workmen's compensation act (Laws 1915, ch. 246). On the death of the employee, before the lapse of the maximum number of payments had been made according to the award, the right to future compensation under the award ceased with his death.

Lahoma Oil Co. v. State Industrial Commission, —— Okla. ——, 175 Pacific 836, p. 837.

INJURY RESULTING IN DEATH—COMPENSATION.

The Oklahoma workmen's compensation act (art. 6, sec. 1) expressly states that it is not intended that any of the provisions of the act shall apply in cases of accidents resulting in death, and no right of action for damages for injuries resulting in the death of an employee is intended to be denied or affected. It can not be insisted that this section applies only to the right of action accruing to the next of kin for pecuniary loss sustained on account of the wrongful death of an employee. The compensation act does not supplant the right of action for pain, suffering, medical expense, etc. An award made to an injured employee does not vest at his death in his representatives, but the right to compensation under the award ceases with his death.

Lahoma Oil Co. v. State Industrial Commission, —— Okla. ——, 175 Pacific 836, p. 837.

WRONGFUL DEATH—APPLICATION OF WORKMEN'S COMPENSATION ACT.

The workmen's compensation act of Oklahoma has no provision applicable in case of accident resulting in death. The act gives no right of action for the recovery of damages for wrongful death nor does it deny the right of action in such case and the existing right of action under other statutes is not affected.

Lahoma Oil Co. v. State Industrial Commission, —— Okla. ——, 175 Pacific 836, p. 837.

NOTICE OF INJURY—ACTUAL KNOWLEDGE.

The workmen's compensation act of Indiana (acts 1915, p. 397; sec. 8020f1, Burns Suppl.) requires an injured employee to give written notice to the employer of the injury; but no rights are waived or forfeited if the employer or his agent had knowledge of the injury. On a petition by an injured miner for compensation, the industrial board found that the employer, the mine operator, by its agents and representatives had actual knowledge of the injury at the time it occurred and that a reasonable excuse was shown for the failure of the miner to give the statutory notice. The findings of the industrial board are binding upon the courts, if there is any evidence tending to sustain such findings. In the instant case the evidence was ample to support the findings of the industrial board on the question of notice.

Vandalia Coal Co. v. Holtz, —— Ind. App. ——, 120 Northeastern 386, p. 387.

INJURY—KNOWLEDGE OF EMPLOYER'S AGENTS—NOTICE UNNECESSARY.

The Indiana workmen's compensation act requires an injured employee to give written notice to the employer of the injury, unless it is shown that the employer, his agent or representative, had knowledge of the injury. A coal miner while operating an electrical machine in a coal mine was struck in the eye by a flying particle. The chief electrician, or machine foreman, under whom the injured miner worked, had actual knowledge of the injury within a few minutes after it occurred; and soon after the injury the miner's eye was examined by the employer's physician. The miner also later reported to the mine boss, the foreman of the mine, that he was unable to work and showed him his eye. The mine boss told him he was not able to work and informed him that his job was ready for him when he got able to work. This evidence was sufficient to justify the findings of the accident board that the employer by its agents and representatives had actual knowledge of the injury.

Vandalia Coal Co. v. Holtz, —— Ind. App. ——, 120 Northeastern 386, p. 388.

PRIMA FACIE CASE—PROOF OF EMPLOYMENT AND INJURY.

In an action by a miner for injuries resulting from the mine operator's failure to ventilate the mine as required by the statute of Iowa, and where it is averred that the mine operator has refused to accept the provisions of the workmen's compensation act, the plaintiff has discharged the burden of proof and makes a prima facie case by proof of his employment, the rejection of the provisions of the workmen's compensation act by the defendant, and that the injury complained of arose out of, and in the course of, his employment. The burden is then cast upon the defendant to rebut the statutory presumption of actionable negligence. Such proof is in itself sufficient to raise a presumption which serves as evidence of the operator's negligence and that such negligence was the proximate cause of the injury complained of.

Gay v. Hocking Coal Co., —— Iowa ——, 169 Northwestern 360, p. 364.

RELATION OF MASTER AND SERVANT—INDEPENDENT CONTRACTOR.

A contract by which one party undertook to drive and construct a minimg tunnel for a particular distance of certain stated dimensions, to do the work in a miner-like fashion and maintain all work driven under the contract until completion, at a certain stated price per lineal foot, the contractor reserving 20 per cent of the contract price until the completion of the work as a guarantee for its completion, the contractor reserving no control of the work more than was necessary to insure its producing the result provided for, does not create the relation of master and servant under the workmen's compensation act of Colorado.

Industrial Commission v. Maryland Casualty Co., —— Colo. ——, 176 Pacific 288, p. 289.

PROOF OF DEPENDENCY—CLAIM FOR COMPENSATION.

Evidence that would sustain the verdict of a jury, if one were rendered upon the proof before the compensation commissioner upon the facts of dependency where that is the ground upon which a claim for compensation is predicated, must be sufficient to support a claim for compensation out of the workmen's compensation fund based upon the same ground.

Poccardi v. Ott, —— W. Va. ——, 96 Southeastern 790, p. 791.

DEPENDENCY—DECISION OF COMPENSATION COMMISSIONERS—REVIEW.

The proof offered by a widow of an employee killed while working in a coal mine, in support of her claim as a dependent for contribution under the workmen's compensation act of West Virginia, was clear and uncontradictory. Under that act, where there is no conflict in the testimony, dependency is not merely a fact finally and conclusively determined by an adjudication of the commissioner, but is a question of law to be determined upon the pertinency and applicability of the proof. To be conclusive the finding of the commission must rest upon conflicting proof about which some doubt may reasonably exist. In the absence of conflict or an adverse adjudication of the widow's right to compensation may be revised and the claim allowed upon appeal to the supreme court.

Poccardi v. Ott, —— W. Va. ——, 96 Southeastern 790.

INJURY ARISING OUT OF EMPLOYMENT—DANGER ZONE.

The operator of a quarry maintained a commissary within the danger zone of its blasting and in effect invited its employees to stop there on the way home. Blasts in the quarry were fired about ten minutes after work ended for the day and a whistle was sounded to give notice of the intended blast. An employee on quitting work stopped at the commissary and on the sounding of the warning whistle failed to seek a place of safety and was killed by a stone from the blast. Under such circumstances the injury to the employee arose out of the employment within the workmen's compensation act of Connecticut.

Merlino v. Connecticut Quarries Co., —— Conn. ——, 104 Atlantic 396, p. 397.

OCCUPATIONAL DISEASE—REJECTION OF ACT.

The question of the liability of a mine operator to a miner on account of an occupational disease contracted in the course of his employment where both the employer and the employee have accepted the terms of the compensation act, can not arise and can not be determined in an action where it is admitted that the employer had rejected the provisions of the workmen's compensation act.

Gay v. Hocking Coal Co., —— Iowa ——, 169 Northwestern 360, p. 362.

EMPLOYEE OF INTERSTATE CARRIER OF GAS—APPLICATION OF ACT.

An employee of an interstate carrier of natural gas assisting in the erection of a derrick to be used in cleaning out a gas well and whose work at the time was wholly distinguishable from the transportation phase of the business, was engaged in work clearly separable and distinguishable from interstate commerce within the meaning of section 52 of the workmen's compensation act of West Virginia, and was entitled to the benefit of the provisions of that act.

Suttle v. Hope Nat. Gas Co., —— W. Va. ——, 97 Southeastern 429, p. 432.

INDUSTRIAL COMMISSION—JURISDICTION AND EFFECT OF AWARD.

An award made by the industrial commission under the workmen's compensation act of Oklahoma does not possess the essentials of a jugdment. Under the continuing jurisdiction of the commission to modify or change an award it can not be said that an award is a fixed, determined, or a definite amount to be paid for a fixed number of weeks. The industrial commission can not enforce the payment of an award by execution or order; but the act provides (art. 2, sec. 16) that the award shall constitute a liquidated claim for damages which may be recovered in an action instituted by the commission.

Lahoma Oil Co. v. State Industrial Commission, —— Okla. ——, 175 Pacific 836, p. 837.

INDUSTRIAL COMMISSION—JURISDICTION CONTINUOUS—CHANGE IN AWARD.

The finding and award of the industrial commission at a stated date on an application by an injured miner for compensation is not final under the Colorado workmen's compensation act in the sense that regardless of the future physical condition of the claimant neither he nor the insurer should be permitted to show any physical change. For this reason the commission not only has the right but it is its legal duty to retain jurisdiction of the proceedings for further action and award if the facts should warrant.

Employers' Mutual Ins. Co. v. Industrial Commission, —— Colo. ——, 176 Pacific 314, p. 316.

INDUSTRIAL COMMISSION—JURISDICTION—DEATH OF INJURED EMPLOYEE.

Where the injuries to an employee result in death the (Oklahoma) workmen's compensation act no longer applies and the industrial commission has no further jurisdiction of the proceedings. Any cause of action arising from the death resulting from the injuries were survived to the personal representatives under the general statute, as though the workmen's compensation act had never become a law. The only effect of the workmen's compensation act was to afford an injured employee a special procedure under which to maintain his action where the injuries do not result in death.

Lahoma Oil Co. v. State Industrial Commission, —— Okla. ——, 175 Pacific 836, p. 837.

FINDING OF FACTS BY REFEREE—COMPREHENSIVENESS.

When a case under the workmen's compensation act is referred to a referee for a hearing and finding of facts, he should make his findings of fact so comprehensive and explicit as to disclose the full history of the accident; and where the compensation board has no hearing de novo, it should not find facts in addition to those stated by the referee.

Gurski v. Susquehanna Coal Co., —— Pa. ——, 104 Atlantic 801, p. 802.

FINDING OF COMPENSATION BOARD—FACTS CONCEDED.

It is not the duty of the compensation board under the Pennsylvania workmen's compensation act to find facts in addition to those stated by a referee. But where the compensation board does find additional facts, it is immaterial where all the parties concede the correctness of the statement of facts contained in the finding of the board.

Gurski v. Susquehanna Coal Co., —— Pa. ——, 104 Atlantic 801, p. 802.

FINDING OF COMMISSION—PRIMA FACIE EVIDENCE OF RIGHT TO RECOVER—INJUNCTION.

A finding and judgment of the industrial commission under the Colorado workmen's compensation act in favor of a claimant is prima facie evidence of his right to recover. The payments awarded can not be enjoined by an indemnity insurance company pending an appeal and before a decision of the court on the questions involved.

Employers' Mutual Ins. Co. v. Industrial Commission, —— Colo. ——, 176 Pacific 314, p. 316.

FINDING OF INDUSTRIAL COMMISSION—REVIEW.

The industrial commission of Colorado, on a petition by an injured miner, entered an order for the payment of a weekly allowance. Subsequently the claimant filed a new petition asking for further compensation, and a finding was then entered to the effect that the claimant was permanently partially disabled, and thereupon the commission made new findings and a new award. This new award was manifestly supported by competent evidence, and it may not be lawfully overturned by the court as neither the first nor the second finding of fact was in excess of the powers of the commission nor procured by fraud, and as both are supported by sufficient competent evidence there is no ground for attack upon either and neither, may be lawfully overturned on appeal.

Employers' Mutual Ins. Co. v. Industrial Commission, —— Colo. ——, 176 Pacific 314, p. 316.

PROCEDURE—RULES OF EVIDENCE.

The workmen's compensation acts relax the common law and statutory rules of evidence and abolish the technical and formal rules of procedure other than those expressly retained, and require each claim to be investigated in such manner as may best be calculated to ascertain the substantial rights of the parties and justly and liberally effectuate the spirit and purpose of their provisions.

Poccardi v. Ott, —— W. Va. ——, 96 Southeastern 790, p. 791.

PROCEDURE—PAYMENT OF AWARD—STAY PENDING APPEAL.

Procedure under the workmen's compensation act of Colorado is summary in character in order to furnish immediate aid to injured employees, and the statute taken as a whole leads to the conclusion that it was not the intention of the legislature that payment of weekly allowances should be stayed or enjoined pending an appeal.

Employers' Mutual Ins. Co. v. Industrial Commission, —— Colo. ——, 176 Pacific 314, p. 316.

APPEAL FROM JUDGMENT CONFIRMING AWARD.

The statute of Wisconsin (Stats. 1917, sec. 2394–21) gives any party aggrieved by the judgment of the court confirming an award of the industrial commission the right of appeal to the supreme court. An appeal is taken from such an order by serving notice on the adverse party and on the clerk of the trial court within 30 days from the date of service or a copy of the order. An appeal taken after that time must be dismissed.

Frontier Min. Co. v. Industrial Commission, —— Wis. ——, 169 Northwestern 312.

APPEAL—"ADVERSE PARTY"—SERVICE OF NOTICE.

The workmen's compensation act of Wisconsin provides for an appeal from the judgment of any court confirming the award of the industrial commission by the service of notice on the "adverse parties." The industrial commission is necessarily a party defendant in such proceedings, but the "adverse parties" are the claimants in whose favor the award was made and the judgment rendered, as they are the owners of the judgment and the only persons who have a substantial pecuniary interest in sustaining it.

Frontier Min. Co. v. Industrial Commission, —— Wis. ——, 169 Northwestern 312.

APPEAL FROM COMMISSIONER—ADDITIONAL EVIDENCE NOT CONSIDERED.

On appeal from a finding of the commissioner under the West Virginia workmen's compensation act the court can consider only such proof as was before the compensation commissioner at the time he acted and ruled upon the application; and the court can not consider evidence taken and filed by the complainant during the pendency of the application on appeal.

Poccardi v. Ott, —— W. Va. ——, 96 Southeastern 790, p. 791.

MINES AND MINING OPERATIONS.

RELATION OF MASTER AND SERVANT.

PROOF OF RELATION—SUIT BY STRANGER.

In simple negligence cases an injured person can not sue as a stranger and recover upon proof which shows the existence of the relation of master and servant.

Montevalo Min. Co. v. Underwood,—— Ala. ——, 79 Southern 453, p. 455.

CONSTRUCTION OF CONTRACT—INDEPENDENT CONTRACTOR.

A mine owner entered into a written contract with a miner by which the latter was to drive a mining tunnel a stated distance and of stated dimensions for a stated price per lineal foot. The mine owner retained no right of control other than that which should secure the proper result from the work. The contract being in writing the relation which it created between the parties thereto was exclusively within the province of the court to determine, and the court determined that the contract did not create the relation of master and servant but that of independent contractor.

Industrial Commission v. Maryland Casualty Co., —— Colo, ——, 176 Pacific 288, p. 290.

ACTIONS—PLEADING AND PROOF OF NEGLIGENCE.

DEFINITE AVERMENTS.

In an action for damages for injuries due to the alleged negligence of the operator, averments of the complaint are sufficiently definite and specific where they fully advise the defendant as to every phase of the charge made against him. Such a pleading is not required to aver more than evidentiary facts.

Jackson Hill Coal & Coke Co. v. Van Hentenryck, —— Ind. App. ——, 120 Northeastern 664, p. 666.

PLEADING—FACTS WITHIN KNOWLEDGE OF DEFENDANT.

A complaint in an action by a miner for damages for injuries received while working in a mine need not aver facts peculiarly within the knowledge of the mine operator or that may be easily ascertained by him.

Jackson Hill Coal & coke Co. v. Van Hentenryck, —— Ind. App. —— 120 Northeastern 664, p. 666.

PLEADING—CAUSAL CONNECTION.

In an action by a miner for damages for personal injuries it is sufficient if there be an apparent causal connection between some, though not necessarily all, of the negligent acts averred and the infliction of the injury complained of. Any other averments may be regarded as surplusage.

Long v. Foley, —— W. Va. ——, 96 Southeastern 794, p. 795.

RECOVERY MUST FOLLOW ALLEGATIONS OF NEGLIGENCE.

In an action by an injured employee in a mine, he alleged that it was his duty to board the cars or trip while in motion, and he averred negligence on the part of the operator in failing to give him proper instructions relative to getting on and off moving trips. Under such an allegation of negligence the complainant can not recover on the theory that the mine operator negligently failed to warn or instruct him not to get on moving trips of cars.

Walsky v. H. C. Frick Coal Co., —— Pa. ——, 104 Atlantic 798, p. 799.

NEGLIGENCE PRESUMED—PRIMA FACIE EVIDENCE.

In an action by a miner for damages for injuries sustained by reason of the negligence of the mine operator in failing properly to ventilate the mine, the burden of proving the negligence charged is upon the complainant and that the injury complained of resulted from such negligence; but he has discharged this burden, under the provisions of the workmen's compensation act and makes a prima facie case by proof of his employment and of the fact that he was injured and that the injury complained of arose out of and in the course of his employment. The statute then casts the burden upon the defendant to rebut the statutory presumption of actionable negligence. Such proof is by the statute made sufficient to raise a presumption which serves as evidence of the employer's negligence and that such negligence was the proximate cause of the injury complained of.

Gay v. Hocking Coal Co., —— Iowa ——, 169 Northwestern 360, p. 364.

NEGLIGENCE PLEADED—PROOF INSUFFICIENT TO SUSTAIN.

The negligence charged in an action by a 17-year-old boy in the operation of coal cars was that the mine operator did not furnish him with reasonably safe cars, connections, and appliances. The proof showed that a trip of 13 cars parted between the seventh and eighth cars and that the seven cars ran away down grade; but there was no evidence of any defects in the connections between the cars. The evidence was all to the effect that the hitchings, clevises, and pins connecting the cars were all in good condition and the cause of the disconnection of the cars remained a matter of conjecture. The allegation of negligence was not supported by the proof.

Walsky v. H. C. Frick Coal Co., —— Pa. ——, 104 Atlantic 798.

INSTRUCTIONS AS TO PROOF OF NEGLIGENCE—ISSUES LIMITED.

Injuries complained of by the complainant received while working in a smelting plant were alleged to be due to the negligence of the company in constructing a supporting form for cement, as a pier or pillar for an ore drier, in such close proximity to a track on and by which was carried around a rabble rake for the purpose of stirring the hot ore, so as to make it necessarily dangerous and hazardous for the employee to work upon such form while the rabble rake was being operated; and also negligence in starting the rabble rake without giving notice or warning to the employee while working upon such form. The proof on the trial of the case narrowed the issue to the sole question of negligence in starting the rabble rake without giving notice to the injured employee. There was no substantial evidence tending to show any negligence as to the construction of the form as charged. In such case it was error for the court to instruct the jury to the effect that if the complainant established one of the allegations of negligence alleged in the complaint they should find for the complainant.

Athletic Min. & Smelting Co. v. Sharp, —— Ark. ——, 205 Southwestern 695, p. 698.
See Daniel Boone Coal Co. v. Turner, —— Ky. ——, 205 Southwestern 931.

ACTION BY BOY—AVERMENT OF IMMATURITY.

A car driver, a boy 16 years of age, sued a coal mine operator for damages for injuries caused by the alleged negligence of the operator in furnishing him an unfit mule to drive. The complaint averred that the plaintiff was 16 years of age and physically and mentally immature and undeveloped. This averment, taken in connection with his age and inexperience, are sufficiently definite for any purpose they serve in the case and have some bearing on the question as to whether the boy knew and appreciated the hazards of the work he was employed to do. These averments fully advised the mine operator as to the character of the charge of negligence.

Jackson Hill Coal & Coke Co. v. Van Heutenryck, —— Ind. App. ——, 120 Northeastern 664, p. 666.

AMENDED COMPLAINT—STATUTE OF LIMITATIONS.

In an action by a miner for damages for injuries no specific grounds of negligence were stated in the original complaint. After the expiration of two years and after the original action was barred by the statute of limitations, an amended complaint or petition was filed alleging specifically and in detail the particular acts of negligence complained of. The rule is where the amendment does not state a new cause of action but only elaborates or amplifies the general charge made in the prior pleading, or states new grounds of specifications germane to such charges and allegations, the amendment will be upheld without regard to the statute of limitations.

James v. Winnifred Coal Co., —— Iowa ——, 169 Northwestern 120, p. 124.

INSTRUCTION AS TO SHOT-FIRING.

A miner's action for damages for injuries was based upon the mine operator's alleged negligence in failing to maintain a proper ventilation in the mine by reason of which there was an accumulation of combustible gases and dust to such an extent that there was an explosion which caused the injury complained of. On the trial of the case under such a charge it was error under such an allegation for the court to instruct the jury to find for the complainant if the defendant or its mine boss failed to use ordinary care in regulating the time and manner in which the miners should fire their shots and negligently allowed them to fire their shots in such a way as to cause the explosion. An instruction is not authorized upon an issue not made or presented by the pleading.

Daniel Boone Coal Co. v. Turner, —— Ky. ——, 205 Southwestern 931, p. 933.

PROOF OF CIRCUMSTANCES—INFERENCE FOR JURY.

Where all the circumstances attending an accident and the resulting injury are proved and where the facts themselves are undisputed. the inference to be drawn and the question as to whether the proper care was given, or whether the circumstances established negligence, is for the jury and not a question of law for the court.

Federal Min. & Smelting Co. v. Anderson, 253 Federal 362, p. 364.

JURISDICTION OF COURT—INJURIES RECEIVED IN ALASKA.

A miner can not maintain an action in either a State or Federal court against a mine operator for damages for injuries received while working in a mine in Alaska. The workmen's compensation law of Alaska supersedes all common-law actions for recovery for personal injuries and is the source of the right of the action and determines the extent of liability. Such an action is no longer transitory but local and the forum is fixed and the remedy can not be sought elsewhere.

Martin v. Kennecott Copper Corp., 252 Federal 207, p. 208.

NEGLIGENCE OF OPERATOR.

QUESTION OF FACT.

A person employed in the operation of a cage at a mine was injured by the descending cage striking a piece of steel protruding into the shaft which was thereby thrown against the complainant causing the injury. The charge of negligence was that the mine operator permitted the pieces of steel to be piled or left near the edge of or near to and over the edge of the shaft by reason of which the cage as it descended struck the end of the steel and threw it up and against the complainant inflicting the injuries complained of. There was some proof to show that the accident occurred as alleged but there was evidence to the contrary. Under such conflicting evidence the question of negligence of the mine operator in depositing the piece of steel causing the injury was one of fact to be determined by the jury.

Federal Min. & Smelting Co. v. Anderson, 253 Federal 362, p. 363.

PLEADING AND PROOF—RES IPSA LOQUITUR.

The negligence of a mine operator is not to be inferred but must be proved by the party charging it, and the doctrine of res ipsa loquitur is not applicable as it is impossible to say that the accident and the circumstances under which it occurred naturally raise the presumption that the mine operator violated any duty which the law imposed upon him.

Suborich v. Alaska United Gold Min. Co., 251 Federal 885, p. 886.

GROUNDS OF NEGLIGENCE—PLEADING.

In an action by a minor for personal injuries caused by the alleged negligence of the mine operator, the complainant may aver the negligence complained of in general terms and he may then show any specific acts of negligence which the evidence conduces to support; but if the complainant specifically avers the acts consituting the negligence he can not then prove or rely upon acts of negligence not alleged in his pleadings.

Daniel Boone Coal Co. v. Turner, ——Ky. ——, 205 Southwestern 931, p. 933.

CONCURRENT CAUSES—LIABILITY.

An oil company maintained a nuisance in the public street in that it permitted a dense volume of smoke from partly burned oil to be suddenly thrown off and out from a machine operated by it obstructing the view of persons passing on the street. The oil company was liable under these circumstances for an injury to a pedestrian caused while enveloped by the smoke, who was struck and run over by an automobile, on the theory that where two concurrent causes operate in producing an injury there may be a recovery against both or either one of the parties responsible for the concurrent causes.

Bonner v. Standard Oil Co., —— Ga. ——, 90 Southeastern 573, p. 574.

PROOF OF CAUSE OF INJURY—RECOVERY.

Where the evidence points to a certain cause for an accident in mining operations that would fasten liability on the mine operator, an injured miner will not be denied redress on the ground that there may be some other possible cause for the accident.

De Nardo v. Stephens-Jackson Co., —— Pa. ——, 104 Atlantic 584, p. 585.

DUTY OWING—FAILURE TO DISCHARGE.

A railroad company owed an employee of a coal mine operator the duty of warning him, while engaged in loading a car of coal of its purpose to set or place an empty car on the same track or switch, but instead of performing that duty itself it depended upon the coal-mining company to discharge the duty, but the coal-mining company neglected to do so, and the miner to whom the duty was owing was injured by reason of the setting of the empty car. The railroad company that owed the duty is liable in damages for the injury resulting therefrom.

Johnson v. Waverly Brick & Coal Co., —— Mo. ——, 205 Southwestern 615, p. 617.

ADOPTION OF DEFECTIVE METHOD OF OPERATION.

The duty of a mine operator to exercise care for the safety of the employees is commensurate with the danger reasonably to be anticipated and the rule is especially applicable to the plan or method of operation deliberately adopted by the employer or his representatives. In such case the employer is liable if an injury to an employee is the result of a defective system not adequately protecting the employees.

De Nardo v. Stephens-Jackson Co., —— Pa. ——, 104 Atlantic 584, p. 585.

SAFETY DEVICE—FAILURE TO INSTALL.

It can not be asserted that because a safety device depends for its effectiveness on human agency, that the prompt and efficient use of such agency is inherently too uncertain and speculative to show a causal connection between the uncertain agency and the injury. Many safety devices, such as signals, depend largely for efficiency on their being promptly put in motion by human agency, and the absence of such signal device is declared negligence per se or at least as prima facie established by positive law. The inherent uncertainty of the human agency operating such device has never been regarded or declared sufficient to break the causal connection as a matter of law. The law presumes that the person operating such device or signal will do his duty and use the same promptly and efficiently when practicable to do so, and it is sufficient in such cases to show that such device is practical, efficient, and in general use.

Honey v. St. Regis Min. & Smelting Co.—— Mo.——, 205 Southwestern 93, p. 95.

UNSAFE PLACE AND APPLIANCES—LIABILITY.

An oil-well driller is liable for injuries received by a "stabber" in his efforts to connect the tubing or casing in an oil well where the operator negligently failed to furnish a sufficiently strong rope or casing line where the casing was hoisted rapidly, instead of slowly according to the custom, and where he failed to furnish a safe light at the place where the stabber was required to work under the rule of liability for the failure of an employer to furnish a safe place and safe appliances.

Long v. Foley, —— W. Va. ——, 96 Southeastern 794, p. 795.

FAILURE TO PROVIDE PLATFORMS AND LADDERS.

A mine operator maintained a shaft 550 feet deep with ladders and platforms 25 or 30 feet apart, but from the 450-foot level in the mine there was but one continuous ladderway without platforms to the bottom of the shaft, a distance of 95 feet. These platforms in the shaft were safety devices and resting places of the greatest importance and to omit them for a space of 95 feet from the bottom of the mine was gross negligence on the part of the mine operator.

Parrish v. Richardson, —— N. C. ——, 97 Southeastern 225, p. 226.

METHOD OF HANDLING ORE—ADOPTING PRECAUTIONARY MEASURES.

A mining and smelting company stored large quantities of ore on the upper floor of an underground tunnel at the same time filling the chute leading to the rooms below and piling the ore over the top of the chute. Occasionally when the ore was drawn from the chute below, the ore above the top of the chute would not fall. This condition was known to the mining and smelting company and was sufficient to charge it with the duty of anticipating danger to the ore tenders in the upper room and of adopting reasonable precautionary methods to prevent the condition, and failing to do so the company is liable in damages for an injury to an ore tender who in passing over the ore in the line of his duty fell with the ore into the chute that had previously been emptied from below.

Federal Min. & Smelting Co. v. Dalo, 252 Federal 356, p. 358.

USE OF GRIZZLIES.

There is nothing necessarily or inherently improper or careless in mining companies using grizzlies in sorting the rock to fall into the ore chute below.

Suborich v. Alaska United Gold Min. Co., 251 Federal 885, p. 886.

LEAVING TIMBER TRUCK ON MINE TRACK.

A driver of a mule train maintaining a speed of some 8 miles per hour hauling ore out of the mine could not anticipate without warning of some kind that a timber truck was on the track around a curve ahead of him, and where he had for months passed the place many times a day without previously encountering timber trucks, with one exception, and the shift boss then promised him that it would not occur again. The leaving of the timber truck upon the track under such circumstances was such negligence as to render the mine operator liable for a resulting injury to the car driver.

Asbury v. Hecla Min. Co., —— Wash. ——, 175 Pacific 179, p. 181.

SWITCHING CARS WITHOUT WARNING.

It is actionable negligence on the part of a coal company and on the part of a railroad company supplying the coal company with cars to switch and run a car onto a track or spur where another car was being loaded with coal and while an employee of the coal company was engaged in trimming the car in the line of his duty by removing rock and foreign material in such manner as to strike and bump the car being loaded and to throw the miner off the car and under the wheels to his severe injury.

Johnson v. Waverly Brick & Coal Co., ——Mo. ——, 205 Southwestern 615, p. 616.

EXPLOSIVES EXPOSED TO CHILDREN—LIABILITY.

A mining company is liable in damages to a boy 8 years old injured by the explosion of a dynamite cap where the company kept such caps in an open box at the side of a building and near a path used by the public, including children, and with knowledge that large numbers of children and adults had used the path for years, and where there was no notice that the caps were dangerous and the boy did not in fact know of the danger.

Anderson v. Newport Min. Co., —— Mich. ——, 168 Northwestern 523, p. 524.

OPERATIONS OF SMELTER—POLLUTION OF STREAM—INJURY TO LANDS.

An ore-washer company operated its plant on a stream and for a period of ten years had caused water, débris, mud, and muck and other foul substances to float down the stream and upon and over adjoining lands to its injury. A land owner in his complaint for damages in an action against the washer company averred that by reason of the flow of water and the deposit of muck and mud and other foul substances, he had lost the use of his residence and was deprived of his lands for farming purposes and other domestic uses for one year next preceding the filing of the complaint. The defendant justified on the ground that its operations had been continuous and notorious and with knowledge and acquiescence of the land owner for a period of ten years. On the trial of the case the washer company requested the court to instruct the jury that the complainant could not recover damages for the pollution of the water running through his land. This instruction was correctly refused for the reason that it barred the complainant's right to recover for the pollution of the stream only, where the injuries alleged and for which damages were claimed consisted not in the pollution of the water, but of the deposit of mud and muck and other foul substances carried down the stream and that had overflowed and settled upon the complainant's land by which he had lost the use of his residence and was deprived of his lands for farming and domestic uses.

Tennessee Coal, Iron, etc., Co. v. Bunn, —— Ala. ——, 79 Southern 360, p. 362.

DUTY OF OPERATOR TO FURNISH SAFE PLACE.

PLEADING—AVERMENTS OF EMPLOYER'S DUTY.

A complaint in an action by a miner for damages for injuries received while working in a coal mine by its allegations showed the relation of the employer and employee between the complainant and the defendant, the character of the work to be done by the complainant, and the equipment furnished by the operator for the use of the complainant as a driver. The averments also showed that the alleged defects or unfitness existed at the time the appliances were furnished the complainant for his use. Under such averments the mine operator is presumed to have known of the defects and unfitness when the alleged appliances were furnished and the duty arises as a matter of law from the relation of the parties. When the averments show the existing relation the law supplies the reason. Good pleading does not require or permit the elaboration of reasons for the rules of law applicable to the case made by the facts stated.

Jackson Hill Coal & Coke Co. v. Van Hentenryck, —— Ind. App. ——, 120 Northeastern 664, p. 667.

DUTY AND BREACH—PLEADING.

It is the duty of an employer to exercise reasonable care to furnish a safe place for his employees to work. This includes the duty of furnishing lights when necessary, having due regard for the character of the work, the time, manner, and place of its performance and the safety of the employee. It includes the exercise of like care to furnish a place which will not deprive an employee of the free use of either hand or arm when such use of both is usual and necessary in the ordinary and usual safe performance of the work required. A pleading that avers such duty and the breach thereof whereby the injury complained of occurred, states a cause of action and is sufficient.

Long v. Foley, —— W. Va. ——, 96 Southeastern 794, p. 795.

CONTINUING DUTY.

A mining and smelting company that stored its ore in the upper chamber of an underground tunnel and over the mouth of an ore chute that conveyed the ore to the lower level was bound to see that the place was reasonably safe and by the exercise of reasonable care in the way of inspection and repair, to see that the place was kept and maintained in a reasonably safe condition.

Federal Min. & Smelting Co. v. Dalo, 252 Federal 356, p. 358.

DUTY OWING TO MINER.

A coal-mine operator owes a miner the duty to furnish him a reasonably safe place to work.

Gay v. Hocking Coal Co., —— Iowa ——, 169 Northwestern 360, p. 362.

MINER'S RELIANCE ON EMPLOYER'S PERFORMANCE OF DUTY.

A timberman in a mine was sent by the shift boss into a different part of the mine to perform another and different kind of work. He had not been informed and had not in fact noticed the dangerous condition and he had the right to assume that the place was safe, especially as it did not appear to him to be dangerous.

Dovich v. Chief Consolidated Min. Co., —— Utah ——, 174 Pacific 627, p. 632.

CONTRACT RELIEVING OPERATOR FROM DUTY.

A coal-mine operator can not relieve himself by contract from the necessity of furnishing his employees a safe place within which to work.

Creek Coal Min. Co. v. Paprotta, —— Okla ——, 175 Pacific 235, p. 237.

FAILURE TO FURNISH—OCCUPATIONAL DISEASE—LIABILITY.

If a coal-mine operator fails to provide a reasonably safe place for a miner to work, or fails to observe the specific requirements of the statute with reference to ventilation, and as a result of such negligence a miner is injured, the mine operator can not avoid liability by calling the disease an "occupational disease," or by showing that diseases of that nature are often the accompaniment or result of such employment even when all due care has been exercised by the mine operator. If the operator was negligent, or if he failed to furnish the statutory amount of ventilation, and if the miner was injured by reason of such violation of the statute, then the operator's liability is foreclosed.

Gay v. Hocking Coal Co., —— Iowa ——, 169 Northwestern 360, p. 363.

PRECAUTIONARY METHODS—DANGEROUS CONDITIONS.

A smelting company in the matter of handling its ores is bound to furnish its employees a reasonably safe place in which to work and to adopt reasonable precautionary methods to prevent dangerous conditions by which employees may be injured.

Federal Min. & Smelting Co. v. Dalo, 252 Federal 356, p. 358.

EMPLOYER'S KNOWLEDGE OF DANGER—PROOF—DECLARATIONS OF FOREMAN.

An administrator of a deceased miner sued the mine operator for damages for the death of the miner resulting from a fall from a ladder caused by another employee falling from the ladder striking the deceased miner and causing him to fall to the bottom of the shaft. The negligence averred was that the mine operator failed to provide proper platforms for the last 100 feet of the shaft in the mine, which was some 500 feet deep. On the trial of the action a miner testified that some time before the accident he informed the foreman that the shaft ought to be finished by putting in the needed platforms, and the mine foreman said it should be done but he did not have the lumber then to finish it. This evidence was competent and admissible for the purpose of fixing knowledge upon the mine operator of the condition of the ladderway. The mine foreman was his representative and vice principal and to show that a statement was made long enough before the death of the miner for the platform to have been constructed.

Parrish v. Richardson, —— N. C. ——, 97 Southeastern 225, p. 226.

COMMON-LAW COUNT—INSTRUCTIONS.

Under a common-law action charging that a coal-mine operator had negligently failed to furnish an injured miner a reasonably safe place in which to work, the mine operator is entitled to an instruction to the effect that if the miner was engaged in making a dangerous place safe then the rule requiring the employer to furnish a safe place did not apply.

Seagle v. Stith Coal Co., —— Ala. ——, 79 Southern 301, p. 303.

INVITEE—WHO IS—DUTY OWING.

A coal-mine operator does not owe the duty of furnishing a safe place to a person in his mine under an invitation of an employee of an independent contractor, and such person can not hold the mine operator liable on the ground that he was an invitee on the premises and that the operator owed him a duty as such.

Seagle v. Stith Coal Co., —— Ala. ——, 79 Southern 301, p. 303.

MINER REMOVING GOB—FALL FROM ROOF.

A coal miner was directed by the mine foreman or superintendent to remove a lot of clay and dirt, the result of a landslide that had fallen upon the mine track. This was not necessarily dangerous work and the miner was not thereby injured. He was injured by a fall from the roof upon which he was not working and with which he had nothing to do. The clay and dirt were being removed preparatory to timbering the roof and the miner was entitled to a safe place in which to work, as he was not engaged in making a dangerous place safe.

Hazard Coal Co. v. Wallace, —— Ky. ——, 205 Southwestern 692, p. 693.

SIGNAL DEVICE—"SKIDDOO" BELLS.

Mine operators in a certain mining district in raising ore in shafts of a depth of 200 feet or more usually installed and used a signal device known as a "skiddoo" bell, by which the hoisterman could signal the men at the bottom of the shaft in case rock or material started to fall from the top of the shaft. A mine operator may be liable for injuries to a miner working in the bottom of a shaft caused by rock or material falling from the tub while being hoisted where no skiddoo bell had been installed, where it appears that the hoisterman could have warned the miner by means of such a bell in time to have permitted him to escape the peril, if one had been installed.

Honey v. St. Regis Min. & Smelting Co., —— Mo. ——, 205 Southwestern 93, p. 95.

DUTY TO PROVIDE SAFE APPLIANCES.

LATENT DEFECTS—PLEADINGS.

The fact that defects in an appliance causing an injury are latent and the employer by the exercise of ordinary care could not have ascertained or known of such defects in time to avoid the resultant injury, is available as a defense; but they are not essential to the sufficiency of a complaint where the employer is charged with negligently furnishing in the first instance defective tools, implements, appliances, or providing a defective or unsafe place in which the employee is to work.

Jackson Hill Coal & Coke Co. v. Van Hentenryck, —— Ind. App. ——, 120 Northeastern 664, p. 667.

EMPLOYER FURNISHING DEFECTIVE APPLIANCES—KNOWLEDGE OF DEFECTS—PLEADING.

A complaint by a 16-year-old car driver for damages for injuries received while driving in a mine alleged that the mine operator carelessly and negligently provided him with a mule that was unsafe, dangerous, lame, mean, unreasonably slow, vicious, balky, and wholly unfit for such work, all of which the mine operator knew in time to have discontinued the use of such mule in time to have avoided the injuries complained of. The complaint also averred that the mine operator furnished the driver the car he was required to drive with an unfit and defective tail chain with knowledge of its defects and unfitness. Under these allegations the complainant was not required to aver knowledge of the mine operator of the defects complained of or that he knew of them in time to replace or repair the same before the injury. The rule is that where an employer constructs or furnishes defective and unsuitable places or tools, implements, or appliances, to be occupied or used by the employee, he is presumed to know of such defects or unfitness and averments of knowledge are not required.

Jackson Hill Coal & Coke Co. v. Van Hentenryck, —— Ind. App. ——, 120 Northeastern 664, p. 667.

UNSAFE APPLIANCES—LIABILITY.

In occupations attended with danger to the employees, such as hoisting rock and ore in a shaft in a common bail or bucket, the operator must use such methods and appliances as are practical and readily attainable and such as are in common use in doing similar work or show that other means or appliances equally efficient were used by him; and a failure to do so when the methods and appliances used are not reasonably safe is a basis for actionable negligence.

Honey v. St. Regis Min. & Smelting Co., —— Mo. ——, 205 Southwestern 93, p. 95.

FAILURE TO SUPPLY—KNOWLEDGE OF PROBABLE CONSEQUENCES.

A mine or quarry operator who places in the hands of or authorizes the use by an employee of a dangerous instrument or article under such circumstances that he has reason to know that it is likely to produce injury is liable for the consequences.

De Nardo v. Stephens-Jackson Co., —— Pa. ——, 104 Atlantic 584, p. 585.

HAZARDOUS EMPLOYMENT—DUTY AS TO SAFE TOOLS.

A quarry operator is engaged in a hazardous business and it is his duty to furnish such tools as will so far as is reasonably practical protect his employees from danger.

De Nardo v. Stephens-Jackson Co., —— Pa. ——, 104 Atlantic 584, p. 585.

DEFECTIVE DRILL—FAILURE TO INSPECT.

A miner was injured while using a defectively welded steel drill. If the miner did not know that the drill was defectively welded and if by the exercise of reasonable care and inspection the mining company should have discovered that the welded steel was weak in that the weld was defective, then negligence could be atributed to the mine operator.

Gold Hunter Min. & Smelting Co. v. Bowden, 252 Federal 388, p. 390.

MULE—UNFITNESS AS AN APPLIANCE.

In an action for damages for injuries the complaint averred that the plaintiff was a boy 16 years of age and was employed as a driver in the defendant's mine, whose duty it was to drive a mule hitched to the coal cars hauling coal out of the mine. The complaint also averred that the mine operator carelessly and negligently provided him with a mule that was unsafe, dangerous, lame, mean, unreasonably slow, vicious, balky, and wholly unfit for such work. The proof tended to show that the mule the boy was driving when injured had been used in the defendant's mine for some seven years before the accident; that one of its hoofs had been partly torn off, that it had been operated on by a veterinary surgeon, was lame, deaf, old, slow, and hard to manage, and that no one had told the boy anything about the mule or how to handle the car when he began to drive. This evidence is sufficient to sustain the allegation of the unfitness of the mule as an appliance to be used by the driver and from which the jury was warranted in inferring knowledge of the facts on the part of the mine operator. Aside from the proof of unfitness, the mine operator is presumed to know the defective conditions of appliances furnished an employee.

Jackson Hill Coal & Coke Co. v. Van Hentenryck, —— Ind. App. ——, 120 Northeastern 664, p. 669.

See Arkansas Smokeless Coal Co. v. Pippins, 92 Ark. 138, 122 Southwestern 113.
Wilson v. Saux Consolidated Min. Co., 16 Utah 392, 52 Pacific 626.

"TAIL CHAIN" AS AN APPLIANCE.

A tail chain by which a mule is hitched to coal cars in hauling cars out of a mine is an appliance within the meaning of the law.

Jackson Hill Coal & Coke Co. v. Van Hentenryck, —— Ind. App. ——, 120 Northeastern 664, p. 669.

DUTY TO WARN OR INSTRUCT.

LIABILITY FOR FAILURE TO WARN.

In an action by a trip driver, a boy 17 years old, for damages for injuries, the charge on which recovery was based was that the mine operator did not give him proper instructions relative to getting on and off moving trips. The proof showed that the driver had worked in the mine for two years prior to the accident and was accustomed to getting on and off moving cars. The proof showed that it was safer to get on the rear end of a moving car than on the front end, even of cars connected together in a trip, and the brakes to be operated were on the rear of the cars. The trip driver was injured in attempting to get on the front end of a car in a moving trip of cars. Notwithstanding his allegation that he was exercising "due care," there was no evidence indicating that his injuries were the result of a lack of instructions by the mine operator, and the operator was not shown to have been negligent in any respect.

Walsky v. H. C. Frick Coal Co., —— Pa. ——, 104 Atlantic 798.

HAZARDOUS UNDERTAKING—EMPLOYER'S KNOWLEDGE OF DANGER.

A miner employed by a coal company to trim the cars of coal while loading was required to stand on the cars and separate stone and other foreign material from the coal and trim them up neatly as the coal was emptied into the cars. The place where the miner worked was dangerous, and the coal company and the railroad company that furnished empty cars and removed loaded cars each knew of the danger and had adopted means to obviate it. The coal company, to prevent injury under such circumstances, made a rule requiring notice to its employees when a car was to be moved, and the railroad company adopted the rule of the mine operator. In the instant case neither the coal company nor the railroad company gave the miner any warning of the placing of a car and by reason of which the miner was injured. The failure to give the warning made both companies liable in an action by the miner for injuries sustained.

Johnson v. Waverly Brick & Coal Co., —— Mo. ——, 205 Southwestern 615, p. 616.

WARNING OF ADDITIONAL DANGERS.

A mine owner is bound to give an employee, working in a place which may become dangerous by reason of perils arising from the doing of other work pertaining to the employer's business different from that in which the particular employee is engaged, such warning of the additional danger as will enable him, with the exercise of reasonable care, to avoid the danger; and this duty can not be delegated so as to free the mine operator from liability for negligence.

Asbury v. Hecla Min. Co., —— Wash. ——, 175 Pacific 179, p. 181.

FAILURE TO WARN—SUDDEN DANGER—STARTING MACHINERY.

A carpenter employed in a smelting plant was engaged in constructing a form for holding and hardening cement as a pier for supporting an ore drier. The form was constructed in close proximity to the ore kiln and to the track upon which ran and moved a rabble rake used for the purpose of stirring the hot ore. When the employee began his work the ore rake was not in motion, and it was the custom of the operator or the person operating the rake to warn the employees when the rake was started. An ore crusher in operation near by made a loud noise, while the rabble rake was operated with little or no noise. While the employee was so engaged the ore rake was set in motion without warning, and he was caught between the hot rake and the form and suffered injuries for which he sued. The failure of the operator to warn the employee of the starting of the rabble rake was negligence, for which he was liable in damages for the injuries occasioned thereby.

Athletic Min. & Smelting Co. v. Sharp, —— Ark. ——, 205 Southwestern 695, p. 698.

DUTY TO PROMULGATE RULES.

RULES TO REGULATE EMPLOYMENT—FAILURE TO PROMULGATE—LIABILITY.

Generally an employer owes to his employees the duty to promulgate and enforce reasonable rules and regulations for their guidance and protection; but in the absence of evidence showing that such rules would be useful and feasible under similar circumstances, the employer can not be held negligent in failing to promulgate rules. A danger may be apparent with or without rules and regulations, and the appearance of danger may be obvious or patent, but existing rules and regulations may neither remove nor lessen the risk.

Suttle v. Hope Nat. Gas Co., —— W. Va. ——, 97 Southeastern 429, p. 434.

PROOF OF NECESSITY FOR RULES.

The rejection or exclusion of testimony offered to show the feasibility and necessity for the promulgation of rules and regulations for the protection of employees while engaged in the performance of dangerous work is erroneous.

Suttle v. Hope Nat. Gas Co., —— W. Va. ——, 97 Southeastern 429, p. 434.

INSTRUCTIONS AS TO RULES—CHARACTER DEFINED.

An instruction on the trial of a case for damages for the death of an employee caused by the alleged negligence of the employer in that he failed to promote rules for the regulation of the business, imposing upon the employer the duty to promulgate and enforce rules and regulations for the protection of his employees should prescribe with reasonable definiteness the nature of the rule sought to be required and not leave to the jury's conjecture the determination of their character.

Suttle v. Hope Nat. Gas Co., —— W. Va. ——, 97 Southeastern 429, p. 435.

DELEGATION OF DUTY.

NONDELEGABLE DUTY.

It is a masterial duty to provide employees, including miners, a safe place to work, and this duty is one which can not be delegated in such a way as to release the master or mine operator from responsibility for failure to perform it.

United Verde Copper Co. v. Kuchn, 253 Federal 425, p. 426.

OPERATOR'S ASSURANCE OF SAFETY.

MINER'S KNOWLEDGE OF DANGER—RELIANCE UPON ORDERS OF EMPLOYER.

A miner working in a mine may act under the direct orders or in the business of his employer and recover for resultant injuries unless the danger was so obvious that an ordinarily prudent man would not have undertaken to obey the order. This rule is based upon the idea that an employee may rely upon the order of the employer, and his superior knowledge, as an assurance that the place is safe.

Hazard Coal Co. v. Wallace, —— Ky. ——, 205 Southwestern 692, p. 693.

CONTRACTS RELATING TO OPERATIONS.

CONTRACT RELATING TO SAFETY OF WORKING PLACE—EVIDENCE.

In an action by a miner for damages caused by the alleged negligence of a mine operator in failing to make safe the miner's working place, a written contract between the mine operator and the miner to the effect that the price paid the miner for mining coal was intended to cover compensation for all work done in making the miner's working place safe, was not admissible in evidence because it had not been pleaded as a defense to the action.

Creek Coal Min. Co. v. Paprotta, —— Okla. ——, 175 Pacific 235, p. 237.

AGREEMENT TO ARBITRATE—EFFECT ON RIGHT TO SUE.

A contract for operating a coal mine and for mining and removing coal provided, among other things, that the question of whether or not the operator left unmined any available, minable, or merchantable coal was to be submitted to arbitrators to be selected by the parties. The operator bound himself to pay the stipulated royalty on the amount of unmined merchantable coal as determined by the arbitrators. Where such a contract provides that the award of the arbitrators shall be final as to the amount and that no action or suit shall be maintained until arbitration is had, then an award is a condition precedent to the right to sue. But in the absence of such a provision, either expressed or necessarily implied, the agreement for the submission to arbitrators is collateral and independent, and while a breach of the agreement will support a separate action it can not be pleaded in bar to an action upon the principal contract. Generally nothing would be determined by an award except the exact question agreed to be submitted to arbitration. The contract involved did not in express terms or by necessary implication make the submission to arbitration a condition precedent to the right to sue, neither did it limit the amount of recovery in the courts to the arbitrators' findings as to the tonnage of coal unmined, and that should have been mined, from which a condition precedent might necessarily be implied.

Flavelle v. Red Jacket Consolidated Coal & Coke Co., ——W. Va. ——, 96 Southeastern 600, p. 602.

AGREEMENT TO ARBITRATE—CONDITION PRECEDENT.

A provision in a contract or a lease of a coal mine that certain difficulties arising under it should be submitted to arbitrators to be selected by the parties will not prevent the lessor and mine owner from maintaining a suit in the first instance to enforce his rights under the contract or lease, except where an award of the arbitrators chosen is made a condition precedent to the right to sue either by the express provisions of the contract or by conditions necessarily implied from its terms.

Flavelle v. Red Jacket Consolidated Coal & Coke Co., ——W. Va. ——, 96 Southeastern 600, p. 602.

AGREEMENT TO ARBITRATE—EFFECT ON MINING OPERATIONS.

A contract or lease by which the owner of a coal mine contracted with the lessee to mine and remove the coal, specified generally the methods of carrying on the operations and the royalties to be paid on different grades of coal. The contract or lease provided for the mining and removal of all merchantable coal, and expressly provided that the question of whether or not merchantable or minable coal was left in any particular abandoned room should be submitted to arbitrators selected by the parties and the lessee should pay royalties on the amount of unmined merchantable coal found and determined by the arbitrators. The parties did not intend to give these requirements a conclusive effect upon all the provisions of the contract, but they did intend to make the report of the arbitrators final and conclusive upon the necessity for leaving unmined any available coal. The arbitration provided for is a condition precedent to the right to maintain an action to recover royalties for any unmined merchantable coal. But there is no declaration of an intention to apply this provision to operations of the mine as a whole or any part of it other than that so definitely prescribed.

Flavelle v. Red Jacket Consolidated Coal & Coke Co., —— W. Va. ——, 96 Southeastern 600, p. 601.

SALE OF WELL DRILLING TOOLS—FRAUD.

An action for damages claimed on the alleged ground that the plaintiff was induced to sell to the defendant an outfit of well-drilling tools at an inadequate price when he was intoxicated and incapable of transacting business, can not be maintained where the proof fails to show the value of the well-drilling tools and where there was neither allegation nor proof that the defendant promised to pay the plaintiff any sum more than that paid and where the plaintiff admitted that he was not intoxicated at the time he executed the contract of sale.

Smith v. Rock Oil & Gas Co., —— Kan. ——, 175 Pacific 378, p. 379.

METHOD OF OPERATING.

RESERVATION OF MINERALS—USE OF SURFACE—CUSTOMARY METHODS.

The bare right given to work a mine under a conveyance or reservation of the minerals with such right, carries with it the right to use so much of the surface as is reasonably necessary. The mine owner has the right to enter and take and hold possession even as against the owner of the soil, and to use the surface so far as may be necessary in carrying on mining operations, even to the exclusion of the owner of the soil. What is necessary and reasonable under such circumstances may be determined by reference to what is customary.

Oberly v. H. C. Frick Coke Co., —— Pa. ——, 104 Atlantic 864, p. 865.

SURFACE RIGHTS.

Where the right to mine and remove minerals is granted, the surface rights and the incidental rights, such as that to use shafts, whether expressed or left to implication arising from the grant, can be used only for the purpose of mining under the particular premises conveyed and not as a means of mining under and removing minerals from other lands. The latter is a privilege or easement that must be granted in express terms.

Oberly v. H. C. Frick Coke Co., —— Pa. ——, 104 Atlantic 864, p. 865.

INJURY TO LAND—MEASURE OF DAMAGES.

A land owner sued an ore washer company for damages for the deposit of muck, mud, and other foul substances caused to be floated down and deposited upon the complainant's land. He alleged that as the proximate consequence thereof the complainant lost the use of his residence, was deprived of his land for farming purposes and other domestic uses, for stock raising, truck farming, and that the lands had been permanently damaged and deteriorated in value. On the trial of the case the court properly refused to instruct the jury at the request of the defendant to the effect that the measure of damages for temporary injury to the land was the difference in rental value, plus the reasonable expense of restoring the premises to their former condition. The request was properly refused because there was no evidence as to the rental value or to the expenses of the restoration of the land, and for the further reason that the complainant's claim included damages for crops destroyed and permanent injury to the land.

Tennessee Coal, Iron, etc., Co. v. Bunn, —— Ala. ——, 79 Southern 360, p. 362.

INJURY TO LAND—INJURY INCREASED WITHIN LIMITATION PERIOD.

A land owner in an action against an ore washer company that operated its plant on a creek above the plaintiff's land, alleged that his land had been injured by the washer company floating down thereon a large body of water, muck, mud, rock, and other débris, forming a large pond, overflowing a large part of complainant's land under cultivation; that said acts had been done for one year next preceding the filing of the claim; that by reason of the wrongful acts of the defendant, the complainant lost the use of his residence, was deprived of his lands for farming purposes and other domestic uses and his lands had been greatly and permanently damaged and lessened in value. These averments show that the washer company had added to the injury of the complainant's land during the year preceding the commencement of the suit, and for that increase of injury the washer company was answerable whatever else of permanent injury the washer company may have caused during the preceding period of ten years.

Tennessee Coal, Iron, etc., Co. v. Bunn, —— Ala. ——, 79 Southern 360, p. 361.

DESTRUCTION OF SURFACE SPRINGS.

A deed granting mining rights expressly absolved the grantee from liability for injury to or destruction of springs on the surface as an incident of the removal of the coal. Such a covenant justifies the injury or destruction of springs at such times as the mine operator may see fit to mine and take out the coal.

Preston County Coke Co. v. Elkins Coal & Coke Co., —— W. Va. ——, 96 Southeastern 973, p. 976.

GRANT OF WAYS AND OPENINGS—CONSTRUCTION.

A conveyance of coal granted the free and uninterrupred right-of-way into, over, and under the land at such points and in such manner, for such ways, tracks, roads, etc., as may be necessary and proper for the purpose of ventilating, draining, digging, and operating and shipping and carrying away the coal. This grant does not limit the owner of the coal in the operation of his mine to a single way or opening. Under such a grant, ways and openings that are appropriate and useful and convenient in the mining of the coal are legally necessary and proper.

Preston County Coke Co. v. Elkins Coal & Coke Co., —— W. Va. ——, 96 Southeastern 973, p. 975.

BORE HOLE FROM SURFACE—VENTILATION OF MINE.

The removal of gas is a necessary incident to the mining of coal so that mining operations may be carried on with safety, and this right is implied and is incidental to every grant of minerals. Where in mining operations gas accumulated in the mine or above the coal that can not be removed by the ordinary means of ventilation, the mine owner and operator may enter upon the surface and drill a bore hole of sufficient size from the surface to the accumulation of gas to release the same and to make the mining operations safe, where such bore hole is necessary to the proper ventilation of the mine and to the mining of coal immediately under the particular surface of land.

Oberly v. H. C. Frick Coke Co., —— Pa. ——, 104 Atlantic 864, p. 866.

TIMBER FOR MINING PURPOSES—DESIGNATION OF SIZE—EFFECT AND RIGHTS.

A mining lease gave the lessee the right to cut and use such timber on the leased land over twenty inches in diameter one foot from the ground as might be needed in mining operations. The lease reserved to the lessor and his assigns the right to cut and remove the larger timber. The prescription of the size of the timber the lessee was permitted to take applies and is determinative of his right to cut and use timber as of the date on which such cutting and use became necessary in the process of mining. By the terms of the lease he was not entitled to take timber of a larger size by reason of growth between the date of the lease and the date of necessity for cutting.

Raleigh Coal & Coke Co. v. Mankin —— W. Va. —, 97 Southeastern 299, p. 301.

TIMBER FOR MINING PURPOSES—DUTY OF OPERATOR TO PROTECT.

A deed conveying the coal underlying a certain tract of land conferred upon the grantee the right to cut and use for mining purposes the timber on the land overlying the coal. Under such a deed, the timber remains the property of the grantor or his assigns until the coal-mine operator exercises his right to cut and appropriate it to the use contemplated by the deed and until so cut and appropriated the mine operator owes the same duty to use ordinary care not to damage or injure that he would have owed if the deed had conveyed to him no permissive right thereto.

Godfrey v. Weyanoke Coal & Coke Co., —— W. Va. ——, 97 Southeastern 186, p. 189.

Raleigh Coal & Coke Co. v. Mankin, —— W. Va. —, 97 Southeastern 299.

ANNOYANCE FROM COAL DUST AND DÉBRIS.

Under a grant of underlying coal with the right for such ways, tracks and roads as may be necessary and proper for ventilating, draining and hauling the coal, the mere annoyance to tenants of the surface owner from coal dust and débris or the destruction of a small garden would not be sufficient to prevent the operator of the coal mine from opening and using a second opening and way over which to haul the coal mined.

Preston County Coke Co. v. Elkins Coal & Coke Co., —— W. Va. ——, 96 Southeastern 973, p. 976.

OPERATION OF CARS—VIOLATION OF RULE—PROOF OF CUSTOM.

A coal-mining company and a railroad company furnishing it cars for loading and hauling its coal, each had a rule to the effect that warning was to be given to persons engaged in loading or trimming cars of coal, when other cars were to be switched or placed. In placing an empty car to be loaded it was so pushed or bumped against a car in process of loading as to throw the miner trimming the car under the wheels and cause the injuries for which he sued. Neither the coal company nor the railroad company can escape liability for so placing the car without warning, by proof that they had habitually neglected to give any warning under such circumstances. No custom or usage can make that lawful which is necessarily dangerous and it can not be said that to push cars back against one upon which a miner was at work without warning was not unnecessarily dangerous.

Johnson v. Waverly Brick & Coal Co., —— Mo. ——, 205 Southwestern 615, p. 617.

GRADES OF COAL—LESSOR ESTOPPED.

A coal-mining lease provided that the lessee should pay to the lessor a stated royalty per ton for the coal mined of a certain designated quality and provided for a less royalty per ton for "slack." The lease also reserved to the lessor the right to inspect the mining operations. The lessor for a period of several years frequently and often daily was present either in person or by his agent while the mining operations were in progress and presumably was familiar with the screens used to separate the low from the high quality of coal. Under such circumstances, the lessor can not after such long period of operations be heard to complain that coal sold by the lessee as "slack" and accounted for as such and the royalty thereon received by him was in fact coal of a higher quality and should have been accounted for at the rate stipulated for the higher grade coal.

Flavelle v. Red Jacket Consolidated Coal & Coke Co., —— W. Va. ——, 96 Southeastern 600, p. 605.

SALE OF NATURAL GAS FOR GASOLINE PURPOSES—LIABILITY FOR DECREASED PRODUCTION.

The lessee of an oil and gas lease as the owner of oil wells producing natural gas, by a written contract sold to a third person all gas produced from the oil wells in operation by such lessee as well as the gas from wells thereafter to be drilled, reserving to the lessee, the seller, enough gas to run the engines employed upon the leased premises. The contract was to continue so long as the purchaser, out of the gas produced, was able to manufacture gasoline in paying quantities. In the operation of its oil wells the lessee, the seller of the natural gas, installed and used a certain patented process to accelerate oil production from the wells, and by the use of this process the vaporous properties of the gas were destroyed by absorption or combination with the oil and the natural gas became unfitted for use in the manufacture of gasoline, to the loss and damage of the purchaser of the natural gas. The lessee of the oil lease by the contract of sale did not restrict his right to develop and exploit the oil field and the contract of sale of the natural gas was only an incident to the use of the oil wells and subordinate to their development for oil. The lessee under the oil and gas lease owed the duty to the lessor to use all reasonable means to maintain the flow of oil and the right of the purchaser of the natural gas was subordinate to that of the original lessor of the oil and gas lease. In the development and production of oil, the lessee did not debar himself from the use of such means as science and experience have proved to be advantageous although they resulted in actual loss and damage to the purchaser of the natural gas.

Beeson v. Drake Oil Co., —— W. Va. —, 97 Southeastern 414, p. 416.

MINE FOREMAN, VICE PRINCIPAL, SUPERINTENDENT—RELATION AND NEGLIGENCE.

AUTHORITY—QUESTION OF FACT.

The question as to whether or not a person employed by an oil company as a vice principal, who was with another employee engaged in lighting fires under oil stills, is a vice principal or a fellow servant is for the jury to determine as one of fact.

Bradshaw v. Standard Oil Co., — Mo. App. —, 204 Southwestern 831, p. 832.

DUAL CAPACITY.

The doctrine of dual capacity is the law in Texas. Under this rule a person may act as a vice principal of an oil company and also as a fellow servant with other employees. It is the character of the act and not the rank of the servant which determines the liability or nonliability of the employer. Under the doctrine of dual capacity the question is: Was the vice principal at the time exercising some authority vested in him as such, or was he in the performance of a mere manual act of service incident to the common employment?

Bradshaw v. Standard Oil Co., — Mo. App. —, 204 Southwestern 831, p. 832.

EVIDENCE—STATEMENTS OF FOREMAN OR VICE PRINCIPAL.

The statements of a foreman of a coal company who was the vice president of the company as to why and how certain cars were moved and set for loading and how a miner came to be injured are admissible in evidence in an action by the injured miner for damages.

Johnson v. Waverly Brick & Coal Co., — Mo. —, 205 Southwestern 615, p. 618.

DIRECTIONS OF GENERAL FOREMAN—ONE EMPLOYEE TO DIRECT ANOTHER.

A general foreman of the Standard Oil Company directed an employee to tell another employee what to do and thereupon told the second employee to do as the first employee told him to do. This order made the first employee a vice principal of the defendant oil company in the particular work to be done, and the oil company was liable for injuries resulting to the second employee from the negligence of the first.

Bradshaw v. Standard Oil Co., — Mo. App. —, 204 Southwestern 831, p. 832.

FELLOW SERVANTS—RELATION—NEGLIGENCE.

WHO ARE.

The driver of a mule train hauling cars in and out of a mine is not a fellow servant with a timberman whose duty it was to do the necessary timbering in the mine; and the driver may recover for an injury due to the negligence of the timberman in leaving the timber truck on the track over which the car driver passed and that was used for the purpose of hauling ore out of the mine.

Asbury v. Hecla Min. Co., —— Wash. ——, 175 Pacific 179, p. 180.

DUTY OF EMPLOYER IN SELECTING.

It is the duty of an employer and of a coal-mine operator to exercise reasonable care in the selection and employment of competent fellow servants.

James v. Winnifred Coal Co., —— Iowa ——, 169 Northwestern 120, p. 122.

DUTY OF EMPLOYER TO ASCERTAIN THE COMPETENCY OF SERVANTS.

It is the duty of a coal-mine owner to exercise reasonable care to ascertain whether a servant he employed was competent to operate a mining machine. This duty is due to other employees working about the machine, but whether such care had been exercised was a question of fact for the jury to determine.

James v. Winnifred Coal Co., —— Iowa, —— 169 Northwestern 120, p. 124.

INJURY DUE TO INCOMPETENCY—BURDEN OF PROOF.

A miner in an action for damages for injuries due to the alleged incompetency of a fellow servant in that he was not competent to run and operate a coal-cutting machine that was operated by compressed air and electricity, has the burden to show by a fair preponderance of the evidence that the fellow servant was incompetent; that such incompetency was known to the mine operator, or by the exercise of reasonable care it should have been known to him and that such incompetency was the proximate cause of the injury.

James v. Winnifred Coal Co., —— Iowa ——, 169 Northwestern 120, p. 123.

INCOMPETENCY OF SERVANT—MEANING.

Incompetency of a servant in the law of master and servant means the want of ability adapted to the performance of a task either because of lack of experience, natural qualifications, or deficiency of disposition to use one's ability and experience properly.

James v. Winnifred Coal Co., —— Iowa ——, 169 Northwestern 120, p. 124.

INCOMPETENCY OF SERVANT—QUESTION OF FACT.

In an action by an injured miner for damages for injuries due to the alleged incompetency of a fellow servant, the question of the incompetency of the servant is one of fact to be determined by the jury under proper instructions.

James v. Winnifred Coal Co., —— Iowa, ——, 169 Northwestern 120, p. 124.

INCOMPETENCY—PROOF.

Proof of a single accident due to the alleged incompetency of a fellow servant would not make out a prima facie case of incompetency, but the facts and circumstances surrounding the occurrence may tend strongly to so indicate and may be considered by a jury upon the question of the incompetency of the servant.

James v. Winnifred Coal Co., —— Iowa ——, 169 Northwestern 120, p. 124.

FELLOW SERVANT—NEGLIGENCE—LIABILITY OF MASTER.

A coal-mine operator is not liable to one miner for injuries caused by the negligence of a fellow miner.

James v. Winnifred Coal Co., —— Iowa ——, 169 Northwestern 120, p. 121.

NEGLIGENCE OF TIMBERMAN—LIABILITY OF OPERATOR.

A miner sued the mine operator for damages for injuries caused by the negligent acts of a timberman in prying stones from the roof of the room where a miner was working and knocking props from under the stones, thereby permitting the stones to fall and producing the injuries complained of. On the trial of the case the court instructed the jury in effect that if the timberman warned the plaintiff to seek a place of safety and he failed to do so he could not recover unless it appeared that the timberman negligently knocked the props from under the roof they were supporting or did something else causing the roof to fall without giving the miner time to reach a place of safety. This instruction was a correct statement of the law and the fact that the timberman warned the miner to seek a place of safety was alone conclusive evidence that he regarded the place as dangerous and it was his duty to wait until the miner had reached a place of safety before doing anything that in any way endangered his life or subjected him to injury.

Creek Coal Min. Co. v. Paprotta, —— Okla. ——, 175 Pacific 235, p. 238.

PROOF OF INJURY INSUFFICIENT TO SHOW NEGLIGENCE.

An employee in a mine was engaged in assisting in the extraction of ore while at the same time another miner was engaged in breaking ore in the mine with a sledge hammer some 10 feet away. While so engaged the miner using the sledge hammer struck a piece or rock or ore in the direction of the complainant and a small piece of the ore or rock, as the rock was being broken up, struck the complainant in the eye, inflicting the injury complained of. There was no evidence to show that the miner using the sledge hammer was careless in the manner in which he broke the rock, as in breaking any rock with a hammer pieces are likely to fly in various directions. There was no evidence that the place in which the complainant was working was in itself unsafe or that the work involved any hazards not usual or incidental to the risk of the employment the complainant was engaged in.

Suborich v. Alaska United Gold Min. Co., 251 Federal 885, p. 886.

MINER'S WORKING PLACE—SAFE PLACE.

OPERATOR'S DUTY TO EXERCISE CARE—KNOWN DANGER.

In hoisting ore in a shaft some 200 feet deep the tubs or bails used did sometimes dump and throw rock down the shaft and there was a known danger of rocks being thus thrown down the shaft and likely to injure the miners working at the bottom of the shaft. It was the operator's duty in such case to use all reasonable means to guard against every known danger. A known danger may exist though the actual occurrences may be at long intervals or even never, but it is the duty of an operator under such circumstances to use reasonable care to make the miner's working place safe.

Honey v. St. Regis Min. & Smelting Co., —— Mo., ——, 205 Southwestern 93, p. 95.

DUTY OF INSPECTION NOT INFERRED.

It may be the duty of a timberman in a mine to prepare and make safe any place which appeared to him to be dangerous; but unless there was a positive duty imposed upon him to inspect in order to ascertain if a place was dangerous such duty should not be inferred.

Dovich v. Chief Consolidated Min. Co., —— Utah ——, 174 Pacific 627, p. 632.

ASSUMPTION OF EMPLOYER'S DUTY—INSPECTION NOT REQUIRED—DANGERS OBVIOUS.

A miner employed in a coal mine has the right to assume that the mine operator has used ordinary care to make his working place reasonably safe and the miner is not required to inspect the place before going to work in order to ascertain whether it is safe. If its dangerous character is so obvious that a person of ordinary understanding and judgment could by the exercise of ordinary care discover the danger in time to prevent the injury there can be no recovery.

Hazard Coal Co. v. Wallance, —— Ky. ——, 205 Southwestern 692, p. 693.

CONTRIBUTORY NEGLIGENCE OF MINER.

PLEADING—DEFENSE.

A complaint for damages by an injured miner averred the negligence of the coal-mine operator and expressly stated that the injury was without any fault on the part of the complainant. Under these allegations the question whether the complainant was guilty of any such negligence, whether common law or statutory, as would preclude a recovery, was a matter of defense.

Jewel Ridge Coal Corp. v. Keen, —— Va. ——, 96 Southeastern 767, p. 768.

QUESTION OF LAW AND FACT.

A miner standing on a car being loaded with coal and engaged in removing stones and foreign substances while in process of loading, was not guilty of such contributory negligence as to prevent a recovery as a matter of law by standing with his back to a cut of cars that were being switched and set on the track or switch on which the coal car was standing; and especially where the miner did not know that the cars were approaching and where under the rules of the railroad company and the custom of the coal company he had no reason to apprehend that any cars would be set without first giving him notice.

Johnson v. Waverly Brick & Coal Co. —— Mo., ——, 205 Southwestern 615, p. 617.

EXERCISE OF CARE.

A mine employee working in a mine must continue at all times to exercise ordinary care for his own safety. A miner or a timberman, at the time of receiving the injury complained of was engaged in work that tended to make the place insecure, and it was his duty to exercise ordinary care to discover the danger and to protect himself from injury, and failing to do this he was guilty of contributory negligence.

Dovich v. Chief Consolidated Min. Co., —— Utah ——, 174 Pacific 627, p. 632.

DISTINCTION BETWEEN CONTRIBUTORY NEGLIGENCE AND ASSUMED RISK.

There is a well-defined distinction between contributory negligence and assumed risk. The defense of assumed risk and contributory are separate and independent, the former arising out of contract, while the latter does not.

Athletic Min. & Smelting Co. v. Sharp, —— Ark. ——, 205 Southwestern 695, p. 698.

SAFE AND DANGEROUS METHOD—CHOICE—INSTRUCTION.

In an action by a miner for damages for injuries caused by being run over by a motor car an instruction requesting the court to charge the jury to the effect that if the injured person advisedly took a dangerous way when a safe way was open to him was correctly refused because it did not include in the hypothesis the essential factor that the plaintiff was aware that of the "ways" described in the request one was safe and the other unsafe.

Montevalo Min. Co. v. Underwood, —— Ala. ——, 79 Southern 453, p. 455.

DISCOVERY OF PERIL—DUTY TO AVOID INJURY.

Any initial negligence on the part of a miner injured in the course of his employment by which he placed himself in the position of peril will not bar his right to recover for injuries for a wrong negligently caused or permitted after the discovery of his peril.

Montevalo Min Co. v. Underwood, —— Ala. ——, 79 Southern 453, p. 455.

FREEDOM FROM CONTRIBUTORY NEGLIGENCE.

UNKNOWN DANGERS.

The driver of a mule car hauling ore out of a mine on the track used for that purpose can not be charged with contributory negligence in failing to avoid a collision with a timber truck left on the track by the timberman where the truck was just beyond a curve and could not be seen and where in many months' operation, going over the track several times each day, no such truck was left upon the haulage track with one exception, and the driver was then promised that it should never be done again.

Asbury v. Hecla Min. Co., —— Wash. ——, 175 Pacific 179, p. 181.

USE OF IRON TAMPING BAR.

An illiterate foreign laborer is not to be charged with contributory negligence as a matter of law and a recovery for injuries defeated because he used an iron tamping bar that caused an explosion resulting in his injury, where the operator knowingly permitted the tamping to be done with iron bars and failed to supply wooden bars or other implements for such purpose and where the injured employee had never been warned and did not in fact know of the danger in using the iron bar.

De Nardo v. Stephens-Jackson Co., —— Pa. ——, 104 Atlantic 584, p. 585.

WILFUL WRONG—EFFECT OF CONTRIBUTORY NEGLIGENCE.

In an action by a miner for injuries caused by being run over by a motor car on a tram track, it was charged in the complaint that the motor car was wantonly or intentionally caused or allowed to run over or against the plaintiff. As against such a charge contributory negligence on the part of the injured person will not defeat a recovery.

Montevalo Min. Co. v. Underwood, —— Ala. ——, 79 Southern 453, p. 455.

IMPROPER MINING OF ONE MINERAL STRATUM—EFFECT ON RIGHT OF SUPPORT.

The owner of land in which there was an underlying stratum of cement rock some 75 feet below the surface conveyed to an adjoining land owner a vein of coal lying some 500 feet below the cement-rock ledge, with the right to mine and remove the coal "without entering upon or injuring the surface thereof." This imposed upon the coal grantee the legal duty of so mining the coal as not to injure the surface, and the surface in this sense included the cement-rock ledge as well as the actual soil surface. The fact that the owner of the limestone ledge did not in some of his mining operations employ the best and most approved methods of mining, or that in some parts of his mine there was negligence in conducting the mining operations, would not constitute such contributory negligence as would defeat his right to injunctive relief against the coal mine operator, where the latter was charged with a violation of his legal duty to maintain the necessary support and where the coal mining had been so conducted as to cause actual subsidence in the mine of the cement-rock ledge owner, even if the mining methods of the cement mine had been above criticism and where the subsidence was the wrongful cause of the injury complained of—the sole proximate cause.

Marquette Cement Min. Co. v. Oglesby Coal Co., 253 Federal 107, p. 116.

SUPPORT OF SURFACE—BUILDINGS ERECTED AFTER LEASE.

The act of removing all support from the superincumbent soil is, prima facie, the cause of the subsequent subsidence of the surface; but if the subsidence is caused by the weight of buildings erected subsequent to the execution of a lease of the mine this is in the nature of contributory negligence and may be proved in defense. But the mere presence of a building or other structure upon the surface does not prevent a recovery for subsidence of the surface, unless it be shown that the subsidence would not have occurred except for the presence of the building. The obligation to support extends only to the soil in its natural state and there is no obligation on the mineral owner to support additional buildings on the surface. But if the subsidence would have resulted if no buildings had been placed on the surface, then the act creating the subsidence is wrongful and the mine owner becomes liable for all damages resulting therefrom, both to the buildings and to the land itself.

Marquette Cement Min. Co. v. Oglesby Coal Co., 253 Federal 107, p. 115.
See Brown v. Robin, 4 Hurlstone & Norman 185.
Hamer v. Knowles, 6 Hurlstone & Norman 459.

ASSUMPTION OF RISK.

RISKS ASSUMED.

DANGERS INCIDENT TO EMPLOYMENT.

A risk assumed by an employee is incidental to the performance of the work and is one that is liable to inflict injury upon him while performing his duties to the employer in the ordinary and usual manner without the inference of negligence on the part of the operator.

Johnson v. Waverly Brick & Coal Co., —— Mo. ——, 205 Southwestern 615, p. 617.

ASSUMPTION OF RISK DISTINCT FROM CONTRIBUTORY NEGLIGENCE.

An employee may assume the risks incident to his employment, although not guilty of contributory negligence in the performance of the work.

Athletic Min. & Smelting Co. v. Sharp, —— Ark. ——, 205 Southwestern 695, p. 698.

INSTRUCTIONS NOT APPLICABLE TO THE EVIDENCE—HARMLESS ERROR.

In an action by a miner for injuries caused by the alleged negligence of a fellow servant it is not proper for the court to submit to the jury the question of the assumption of the risk where it is entirely outside of the pleadings and of the evidence. But a mine operator can not complain of such an instruction where it was clearly in his favor.

Creek Coal Min. Co. v. Paprotta, —— Okla. ——, 175 Pacific 235, p. 238.

RISKS NOT ASSUMED.

HIDDEN DANGERS.

The rule as to the assumption of risk does not apply where the danger is hidden and unknown to an employee.

De Nardo v. Stephens-Jackson Co., —— Pa. ——, 104 Atlantic 584, p. 585.

PLACE OF WORK—DANGEROUS POSITION.

A carpenter employed in making certain repairs on a form in a smelting plant was injured by being caught between the form on which he was working and a molten-ore rake. It can not be said as a matter of law that the carpenter assumed the risk of the danger because he voluntarily placed himself in a dangerous position and that he could have stayed in a place of safety and performed the work, where the undisputed evidence does not show that the carpenter could have stayed at a different place and performed the work.

Athletic Min. & Smelting Co. v. Sharp, —— Ark. ——, 205 Southwestern 695, p. 697.

OBEYING COMMAND OF FOREMAN—DANGERS NOT OBVIOUS.

In an action by a miner for damages for injuries caused while riding on an empty car it can not be held as a matter of law that so to do was an act involving obvious danger, so dangerous that no reasonably prudent person would subject himself to its hazard, especially where it appeared that the complainant was directed by the foreman to ride the empty cars back to the "stock pile."

Montevalo Min. Co. v. Underwood, —— Ala. ——, 79 Southern 453, p. 455.

NEGLIGENCE IN FAILING TO WARN.

A miner engaged in trimming cars in process of loading with coal by removing rock and other foreign substances and arranging the coal on the car, does not assume the danger of being knocked off the car by the switching and setting of other cars on the same track or switch, where it was a rule and the duty of both the railroad company and the coal-mine operator to warn the employees engaged in trimming the cars of the intention to set or switch other cars.

Johnson v. Waverly Brick & Coal Co., —— Mo. ——, 205 Southwestern 615, p. 617.

DANGER FROM RABBLE RAKE—WARNING TO EMPLOYEE.

A carpenter was engaged in making certain repairs upon a form in a smelting plant and around which a molten-ore rake passed when in operation and by which the carpenter was caught and injured. It can not be said as a matter of law that the carpenter assumed the risk of injury by standing within the orbit of the molten ore or rabbble rake, where it appeared from the evidence that the rake was stopped at the time the carpenter began the work and that it was the custom of the operator, or those operating the rabble rake, to give notice to employees about the form before the rake was started or set in motion.

Athletic Min. & Smelting Co. v. Sharp, —— Ark. ——, 205 Southwestern 695, p. 697.

DEFECTIVE APPLIANCE—DEFECT NOT DISCOVERABLE.

A miner was injured while operating a drill in the defendant's mine. The miner was furnished with a steel drill over 3 feet long, and believed it to be sufficiently strong for the purpose for which it was furnished. The steel drill had been broken and had been carelessly welded together in a defective method and was in fact dangerous and unsafe. The miner in using the broken and welded drill did not as a matter of law assume the risk if the breaking was due to the improper welding if he did not know that the steel was defectively welded and if by the exercise of reasonable care the inspectors for the mining company should have discovered that the welded steel was weak and unsafe.

Gold Hunter Min. & Smelting Co. v. Bowden, 252 Federal 388, p. 390.

OBSTRUCTION ON HAULAGE TRACK.

The driver of a mule train of cars hauling ore out of a mine having no control over a timber truck and having no working connection with the timberman does not assume the risk of danger caused by the timberman leaving a timber truck on the haulage track around a curve where it could not be seen by the driver in time to avoid the injury complained of.

Asbury v. Hecla Min. Co., —— Wash. ——, 175 Pacific 179, p. 181.

PROXIMATE CAUSE OF INJURY.

PROXIMATE CAUSE OF INJURY—INTERVENING AGENCY—INFERENCE.

A mine was operated by a shaft some 550 feet in depth. The miners went in and out of the mine by means of ladders resting on platforms some 25 to 30 feet apart. The lowest or last platform was 95 feet above the bottom of the shaft with a continuous ladder for that distance by which the miners must descend and ascend from the mine. Three miners were descending the 95-foot ladder when from some unknown cause the upper one fell, striking the second one, and he in turn fell and struck the third one, causing him to fall to the bottom of the shaft, receiving injuries resulting in his death. The negligence of the mine operator in failing to put in platforms and in maintaining a ladder 95 feet in length must be regarded as the proximate cause of the death of the third and lowest miner and the falling of the first and the second miners and the striking of the third by the second is not such intervening agency as to constitute a defense to an action for damages for the death of the third miner in the light of the evidence which showed that one purpose of the platforms was to catch a falling miner.

Parrish v. Richardson, —— N. C. ——, 97 Southeastern 225, p. 226.

INDEPENDENT CONTRACTOR.

CONTRACT—RELATION NOT AFFECTED BY PROOF OF CUSTOM.

A miner undertook by written contract with a mine owner to drive and complete a mining tunnel for a stated distance and of stated dimensions at a stated price per linear foot. A certain per cent of the contract price was reserved to insure the completion of the work. Proof of a custom or usage in connection with the work to the effect that in order to hasten the work of driving the tunnel miners were sometimes paid in accordance with the amount of work done and that in such cases the work was done under the control of the tunnel owner, could not have the effect of changing the relation of the owner and an independent contractor to that of master and servant.

Industrial Commission v. Maryland Casualty Co., —— Colo. ——, 176 Pacific 288, p. 289.

NEGLIGENCE OF EMPLOYEE—LIABILITY OF MINE OPERATOR.

A coal-mine operator can not be held liable to an employee for injuries caused by the acts or omissions of an employee of an independent contractor.

Seagle v. Stith Coal Co., —— Ala. ——, 79 Southern 301, p. 303.

RIGHT TO SURFACE SUPPORT.

COVENANT TO SUPPORT SURFACE.

A railroad company by condemnation proceedings sought to appropriate a right of way over certain mining ground. A compromise agreement was entered into by which in consideration of the right of way the railroad company covenanted and agreed that in case it should make any excavation upon the adjoining land that should interfere with the natural support of the surface thereof, it would construct and maintain a retaining wall or other devices necessary to prevent its slopes from encroaching upon the adjoining land. The railroad company made an excavation, the result of which was that the shaft of the mining company was forced out of alignment and became useless for the purposes for which it was constructed. After the damage to the shaft the railroad company erected retaining wall or devices calculated to prevent injury to the property of the mining company. The covenant does not contemplate that the proposed retaining wall or other devices was to be of a preventive nature only and not of a remedial character. It does not mean that the building of a retaining wall by the railroad company might follow after the construction of the slope and relieve the railroad company of damages accruing in the mean time. The covenant required the railroad company to anticipate by the construction of a reasonable wall or device the damages which might result; and the fact that the railroad company erected a retaining wall after the damage was done can not deprive the mining company of the contractual rights it is entitled to demand, and to recover such direct and natural damages as resulted from the breach of the railroad company's covenant.

Gumaerd Lead & Zinc Co. v. Erie R. Co., —— N. J. Law ——, 104 Atlantic 134, p. 135.

PRESUMPTION AS TO RIGHT OF SUPPORT—EXCLUSION OF RIGHT.

Where there has been a separation of the minerals and surface in ownership the law presumes that the surface owner has a right to support unless the language of the instrument regulating the separate rights clearly show the contrary. In order to exclude a right of support the language used must unequivocally cover such intention either by express words or by necessary implication. The same presumption in favor of a right of support which regulates the rights of parties in the absence of an instrument defining them will apply also in construing the instrument when it is produced. If the introduction of a clause in the conveying instrument to the effect that the mines must be worked so as not to let down the surface would not create an inconsistency with the actual clauses of the instrument, then it means that the surface can not be let down.

Marquette Cement Min. Co. v. Oglesby Coal Co., 253 Federal 107, p. 113.

ABSENCE OF AGREEMENT TO SUPPORT—RIGHTS OF PARTIES.

Where the surface of land belongs to one owner and the underlying minerals to another, no evidence of title appearing to regulate or qualify the relative rights of enjoyment, the owner of the minerals can not remove them without leaving support sufficient to maintain the surface in its natural state.

Marquette Cement Min. Co. v. Oglesby Coal Co., 253 Federal 107, p. 114.
See Wilms v. Jess, 94 Ill. 462, 34 Am Dec. 242.
  Lloyd v. Catlin Coal Co., 210 Ill. 460, 71 N. E. 335.
  Donk Bro. Coal & Coke Co. v. Novero, 135 Ill. App. 633.
  Seitz v. Coal Valley Coal Min. Co., 147 Ill. App. 85.
  Williams v. Gibson, 84 Ala. 228, 4 Southern 350.
  Erickson v. Michigan Land, etc., Co., 50 Mich. 604, 16 Northwestern 161.
  Lord v. Carbon Iron Mfg. Co., 42 N. J. Equity 157, 6 Atlantic 812.
  Marvin v. Brewster Iron Min. Co., 55 N. Y. 538, 14 Am. Rep. 322.
  Noonan v. Pardee, 200 Pa. St. 474, 50 Atlantic 255, 86 Am. St. Rep. 722.
  Penman v. Jones, 256 Pa. 416, 100 Atlantic 1043.

SURRENDER OF RIGHT—PRESUMPTION.

The right of support is vital to the owner of the overlying surface and strata and is not presumed to have been given up unless expressly or by strong implication.

Marquette Cement Min. Co. v. Oglesby Coal Co., 253 Federal 107, p. 111.

GRANT OF MINERALS—EFFECT ON RIGHT TO SUPPORT.

A grant of underlying coal with the right to mine and remove the same, but reserving the surface, does not permit the destruction of the surface or any part thereof by depriving it of its subjacent support.

Godfrey v. Weyanoke Coal & Coke Co.,—— W. Va.——, 97 Southeastern 186, p. 187.

OBLIGATION ON COAL-MINE OPERATOR—WAIVER.

Ordinarily the grantee or lessee of coal is required to leave such part of the coal as will suffice to support the surface in its natural condition or to construct other permanent artificial support, except where the grantor and owner of the surface has expressly and clearly exonerated the coal-mine operator from the burden of that servitude.

Godfrey v. Weyanoke Coal & Coke Co., —— W. Va. ——, 97 Southeastern 186, p. 188.

SEPARATE MINERAL STRATA—RIGHT TO SUPPORT.

The owner of land with a ledge of cement rock some 75 feet below the surface and with a coal seam some 600 feet below the surface conveyed the coal to an adjoining land owner with the right to mine and remove the coal "without entering upon or injuring the surface thereof." The word "surface" does not necessarily mean the top of the glacial drift, soil, or the agricultural surface, but it means, when applied to the construction of the particular deed, that part of the earth or geologic section lying over the minerals in question, and the owner of the cement stratum is entitled to the same rights as to surface support as the actual surface owner.

Marquette Cement Min. Co. v. Oglesby Coal Co., 253 Federal 107, p. 111.
See Yandez v. Wright, 66 Ind. 319, 32 American Rep. 109.
    Robertson v. Youghiogheny River Coal Co., 172 Pa. 566, 33 Atl. 706.
    Mundy v. Rutland Lt., 23 Chan. Div. 8.
    Humphries v. Brogden, 12 Q. B. 739.

EXCHANGE OF DIFFERENT STRATA OF MINERALS—RIGHT TO SUPPORT OF OVERLYING STRATUM.

The owner of land conveyed to an adjoining owner the cement rock and clay lying some 75 feet below the surface, with the right to mine the same without entering upon the surface, but the deed contained no covenant not to injure the surface. The other owner conveyed a lower vein of coal in his land to the grantor in the first deed, together with the right to mine and remove the same without entering upon or injuring the surface thereof. The deeds do not define the meaning of the word "surface," and the deed conveying the cement rock does not secure to the grantor, the coal owner, the right to subside the overlying cement mine. But the implication is to the contrary from the provision giving the right to mine and remove coal "without entering upon or injuring the surface." The restrictions as to the mining are upon the coal owner and not upon the cement-rock owner. It is not probable that the cement-rock owner would intentionally agree that the relatively unimportant agricultural surface should be preserved but assent to the letting down of his valuable rock ledge and mine. The provision that the coal owner should not enter upon or injure the surface is equivalent to a provision that the coal mine should not be worked so as to "let down the surface," and this provision is not inconsistent with that giving the right to mine and carry away the coal and is clearly to the effect that the coal mine must be so worked as not to let down the surface, and "surface" in this sense applies to the cement-rock stratum.

Marquette Cement Min. Co. v. Oglesby Coal Co., 253 Federal 107, p. 113.

RULE OF STATE COURTS BINDING ON FEDERAL COURTS.

The rule established by the supreme court of Illinois for a long period of time is that the right of surface support in connection with the underlying minerals is absolute and is a substantial part of the mass of rights constituting ownership of lands, and is not an incident of ownership nor an easement. Where a rule of property has been established and where mining rights have been granted in view of the rule established by a State court, the same rule will be followed when a controversy between a surface owner and an owner of the underlying minerals arises in a Federal court.

Marquette Cement Min. Co. v. Oglesby Coal Co., 253 Federal 107, p. 113.
See Wilms v. Jess, 94 Ill. 464, 34 Am. Dec. 242.
Lloyd v. Catlin Coal Co., 210 Ill. 460, 71 Northeastern 335.
Kuhn v. Fairmont Coal Co., 66 W. Va. 711.
Kuhn v. Fairmont Coal Co., 215 United States 349.
Kuhn v. Fairmont Coal Co., 179 Federal 191.

NUISANCE.

WHAT CONSTITUTES—PROTECTION AGAINST.

The statute of Montana (Sec. 6162, Rev. Codes), provides that anything which is injurious to health or is indecent or offensive to the senses, or is an obstruction to the free use of property or that interferes with the comfortable enjoyment of life or property, is a nuisance.

The statute contemplates that a legitimate and useful business or occupation shall not be suspended on account of some imaginary or trifling annoyance that may offend the overrefined taste or that may disturb the supersensitive nerves of a fastidious person, but it does not permit a person to be driven from his home or compelled to live in it in positive discomfort in order to accommodate another in the pursuit of his business which offends the mind and taste of the average individual.

Cavanaugh v. Corbin Copper Co., —— Mont. ——, 174 Pacific 184, p. 185.

LAWFUL METHOD OF CONDUCTING MINING OPERATIONS.

Where the proof brings a mining company's mining operations within the statute defining nuisances, it is no defense to say that the operations were carried on according to approved methods, or that in maintaining the nuisance the company exercised due care, or that mining is necessary to the industrial life of a particular district. Community benefits can not be urged as justification for the injury or destruction of private property without compensation.

Cavanaugh v. Corbin Copper Co., —— Mont. ——, 174 Pacific 184, p. 185.

IMPROPER OPERATIONS—INJUNCTION.

Mining activities were begun in the residential part of a city after it had been laid out for residential purposes. Before such time it was a desirable and quiet neighborhood and well adapted for residential purposes. A mining shaft, tramway, hoisting engine, air compressor, water container, blacksmith shop, and other necessary machinery were placed in close proximity to a dwelling house and the inmates were thereafter disturbed at all times during day and night by unusual noises, ringing of bells, dumping of cars, running of cars over the tramway, rumblings and vibrations of the hoisting engine, and periodically by day and night there were heavy explosions of dynamite which awakened the sleeping inmates and jarred and shook the house and furniture. The noise, vibrations, and concussions were a source of great annoyance and discomfort to the inmates of the dwelling and made it unpleasant and uncomfortable to live in and caused the owner's wife to become nervous and her health temporarily injured. The residence itself suffered structural injury and its value depreciated one-half. Proof of such operations would under the statute of Montana constitute a nuisance.

Cavanaugh v. Corbin Copper Co., —— Mont. ——, 174 Pacific 184, p. 185.

INJURY TO LANDS—MEASURE OF DAMAGES—OPINION OF WITNESSES.

In an action by a land owner against an ore washer company for damages to his land caused by maintaining a nuisance in permitting muck, mud, and other foul and deleterious substances to flow down and deposit upon the complainant's land, the measure of damages is the difference between the value of the land before and the value after the alleged injuries. Witnesses familiar with the value of the land may, after stating all the conditions and describing the injuries in detail, give their opinion as to the value of the land before and after the alleged injuries.

Tennessee Coal, Iron, etc., Co. v. Bunn, —— Ala. ——, 79 Southern 360, p. 362.

INJURY TO LAND—ACQUIESCENCE—ADDITIONAL INJURY WITHIN STATUTORY PERIOD.

Nuisance in that the defendant had caused to be floated down upon the complainant's land a large body of water and muck, mud and rock, and other débris from its ore washer plant and these had overflowed a large part of complainant's lands and the complainant thereby lost the use of his residence and was deprived of his lands for farming purposes and other domestic uses. The complaint expressly averred that such nuisance had been so maintained for one year next preceding the filing of the complaint. The defendant's plea averred that it had maintained and operated the washer continuously, openly, uniformly, and notoriously for a period of more than 10 years prior to the filing of the suit, to the knowledge and with the acquiescence of the complainant, and that during such period the deposits and overflow complained of had been, openly, continuously, and uniformly made on the complainant's lands with his knowledge and acquiescence and with the same results as the overflow and deposits complained of in the complaint. The averments of the complaint are sufficient to show, as against the plea, that the injuries complained of in the year preceding the commencement of the suit were in addition to and caused damages different and greater than those in which and to which the complainant had acquiesced for the preceding 10 years, and were sufficient in this respect to avoid the effect of his acquiescence for the statutory period of limitations.

Tennessee Coal, Iron, etc., Co. v. Bunn, —— Ala. ——, 79 Southern 360, p. 361.

LANDLORD AND TENANT—INJUNCTION—PARTIES.

In an action by a land owner to enjoin a nuisance which consists in the continuous throwing of rock and other débris on the complainant's land, the tenant in the possession of the land is a party beneficially interested and may be joined as a party plaintiff in proceedings for an injunction in order that a complete decree may be rendered; but in an action for damages for the trespass the tenant is not a proper party.

Woodstock Operating Corp. v. Quinn, —— Ala. ——, 79 Southern 253, p. 254.

INJUNCTION.

FINANCIAL ABILITY OF DEFENDANT TO RESPOND IN DAMAGES.

On the hearing of a bill of equity to enjoin a trespass consisting of the continuous throwing of rock and mining débris on the complainant's land on the ground that no adequate relief can be given in a court of law, a court of equity will take account of the financial status of the defendant as bearing on his ability to respond in damages when the nature of the damage is not irreparable.

Woodstock Operating Corp. v. Quinn, —— Ala. ——, 79 Southern 253, p. 255.

DANGEROUS AND INJURIOUS OPERATIONS—INJUNCTION.

A deed conveyed the surface of a town lot and a residence thereon to a purchaser and reserved the minerals beneath the surface with the right to mine and extract the same, but not in such manner as to disturb, damage, or interfere with the purchaser's possession. The grantee or purchaser under the deed can not deny generally the right to utilize the property in the minerals, but he is not estopped by his deed to complain of the method of carrying on mining operations that disturb and interfere with the quiet and peaceable possession and enjoyment of his own premises, or of acts that cause damage to his property.

Cavanaugh v. Corbin Copper Co., —— Mont. ——, 174 Pacific 184, p. 186.

DESTRUCTION OF SPRING.

Mining operations can not be enjoined and prevented on the ground of injury to springs on the surface where the grant of the mining right expressly provided that the operations should be carried on by the mine operator without being liable for any injury to the surface or anything therein or thereon, or "to the springs or water-courses thereof."

Preston County Coke Co. v. Elkins Coal & Coke Co., —— W. Va. ——, 96 Southeastern 973, p. 976.

REMOVAL OF SUPPORT—RIGHT TO ENJOIN.

The owner and operator of a mine engaged in mining cement rock from a mine some 100 feet below the surface may enjoin the owner of a coal seam lying some 500 feet below the complainant's mine, from so mining out and removing the coal as to cause subsidence to the complainant's mine, thereby rendering his mining operations dangerous and causing subsidence resulting in injuries and irreparable loss, where the deed conveying the underlying coal seam to the coal mine operator granted the right to mine and remove the coal "without entering upon or injuring the surface thereof," and where it plainly appears that the remedy at law would not be as certain, prompt, complete, and efficient to the ends of justice and its prompt administration as the remedy in equity, and on the theory that one person can not be permitted to continuously damage another and compel the latter to accept money in satisfaction and where the proof clearly shows that the injuries already sustained and to result from continued coal mining is irreparable.

Marquette Cement Min. Co. v. Oglesby Coal Co., 253 Federal 107, p. 117.
See Bibby v. Bunch, 176 Ala. 585, 58 Southern 916.

SALE OF SURPLUS GAS—RESTRAINING USE BY SELLER.

A natural gas company was producing gas in the Beaver Meadow district and also owned producing wells in another district, and from the wells in both districts supplied its customers and itself. By a contract in writing it agreed to sell to another gas company all the "surplus natural gas" in the Beaver Meadow district, reserving to to itself the right to furnish gas to its customers and to use gas for itself from that particular district. Under these circumstances, the purchasing company could not enjoin the selling company either from disposing of its gas in the second district in a manner different from that at the time of the execution of the contract of sale, or from increasing its customers or otherwise using the gas produced in the Beaver Meadow district, as the contract of sale included the surplus gas only, and this was the gas remaining after whatever use the producing and the selling company might choose to make for any purpose it saw fit.

Elk Natural Gas Co. v. Ridgeway Light & Heat Co., —— Pa. ——, 104 Atlantic 546.

INJUNCTION TO PREVENT TRESPASS—MINING OVER LINE—DAMAGES.

In a suit by the owner of coal lands to enjoin an adjoining mine owner from mining over the line and for an accounting and for damages for negligently mining over the line and removing the coal, the rule in equity as to the measure of damages is the same as the rule at law. A trespasser can not change the amount of his liability by simply changing the forum and no lower measure of damages for a trespass not negligent or not willful could be substituted in equity for that fixed in law.

Mt. Savage George's Creek Coal Co. v. Monahan, —— Md. ——, 104 Atlantic 480, p. 484.

VIOLATION OF INJUNCTION—MEASURE OF DAMAGES.

In an action for the possession of coal lands, where there was a real contest as to the title of such lands, and where the defendant continued to mine coal in disobedience of an injunction, the measure of damages for the plaintiff's recovery was the value of the coal at the tipple, less the cost of mining. Mining the coal in violation of an injunction was sufficient to deprive the defendent of any profit on the coal mined.

Staub v. Sewanee Coal, Coke & Land Co. —— Tenn. ——, 205 Southwestern 320, p. 332.

MINING OVER LINE.

NEGLIGENT MINING OVER LINE—STATUTORY REGULATIONS—DAMAGES.

The rule in reference to trespass and negligence in mining coal over the line was not changed by the statute of Maryland. The statute of Maryland provides that in mining over the line by one operator the measure of damages "in the absence of fraud, negligence, or willful trespass, is the value of the coal in its native state." The statute also provides that if one operator "furtively or in bad faith works and abstracts minerals" then the offender may be charged with the whole value of the minerals taken and allowed no deduction for the work of mining. "Negligence" as used in the first paragraph is not embraced in one of the terms "furtively or in bad faith" as used in the second paragraph and there is no part of the statute applicable where there was negligence in mining over the line. The statute does not change the rule where coal is taken as the result of the negligence of the trespasser. A trespass in mining coal may be negligent though the trespasser did not know that he was over the line until informed by a surveyor, but where he did not know that he was not over the line and could have easily found out whether he was as this was his duty to do, and especially so where the offender knew that he was near the line and had been warned not to get over the line, and where he continued the operations for a period of four months without making any effort to ascertain the line.

Mt. Savage George's Creek Coal Co. v. Monahan, —— Md. ——, 104 Atlantic 480, p. 483.

BOUNDARY—KNOWLEDGE OF TRESPASSER—PROOF.

Under a charge of negligence of a coal-mining company in mining over the line it is not necessary to show that the trespasser knew that he was working beyond the line, but it is sufficient that he knew that he was near it and had been warned not to go over the line, and where it was a simple matter for an engineer to locate the line, and the circumstances were such as to suggest the propriety or necessity of fixing the line in the mine definitely before any coal was taken in the particular direction, and where the mining company almost immediately after an injunction was served located the line and where it appeared that the mining company made various attempts to lease the coal on the adjoining land because its officers knew that they had mined up to or near the land.

Mt. Savage George's Creek Coal Co. v. Monahan, —— Md. ——, 104 Atlantic 480, p. 482.

KNOWLEDGE OF BOUNDARY—PRESUMPTION—RULE AS TO DAMAGES.

A coal-mine operator is held to know the boundary between him and the adjoining owner. If he has reason to believe, or if he is warned that he is near the line and makes no effort to ascertain the fact where he could easily find out and continues to mine and crosses the line in his mining operations, the rule of damages for negligent mining is applied. The reason of this is that the work is done underground and ordinarily the owner of the adjoining coal has little, if any, means of knowing that his property is being encroached upon. It would seem to be more important to have such a rule as to coal and minerals, as the owners can not as well protect themselves against trespass, inasmuch as the coal or minerals are underground.

Mt. Savage George's Creek Coal Co. v. Monahan, —— Md. ——, 104 Atlantic 480, p. 484.

See Martin Coal Co. v. Cox, 39 Md. 1.

Atlantic, etc., Coal Co. v. Maryland Coal Co., 62 Md. 135, p. 143.

MEASURE OF DAMAGES—STATUTORY AND COMMON LAW.

The statute of Maryland provides that where a person furtively or in bad faith works and abstracts minerals from the land of another the offending person may be charged with the whole value of the minerals taken and allowed no deduction in respect of his labor and expenses in getting them. This statutory rule as to the measure of damages is not materially different from the common law rule existing before the enactment of the statute, excepting the offender would not be entitled to deduct the cost of removing the coal to the mouth of the mine when that mode of ascertaining the value is adopted, if done furtively or in bad faith. The statute does not say "without deducting the cost of severing the coal," but the offender is to be allowed "no deduction in respect of his labor and expenses in getting them." The offender might, in addition to that, be liable for exemplary damages, as the statute should not be construed to prohibit such damages if the circumstances justified them.

Mt. Savage George's Creek Coal Co. v. Monahan, —— Md. ——, 104 Atlantic 480, p. 483.

REMOVAL OF COAL—INNOCENT TRESPASS—MEASURE OF DAMAGES.

Under the statute of Maryland, in the absence of fraud, negligence, or wilful trespass, the measure of damages for the wrongful taking of coal is the value of the coal in its native state before severance to the owner thereof at the time of taking.

Mt. Savage George's Creek Coal Co. v. Monahan, —— Md. ——, 104 Atlantic 480, p. 483.

NEGLIGENT TRESPASSER—VALUE OF COAL AT PIT'S MOUTH.

The real owner of coal as against a negligent trespasser is entitled to recover the value of the coal per ton for its severance without deducting the cost of severing it—that is, its value after it has become a chattel, which it has so become by the illegal act of the trespasser. If the coal is permitted to lie where mined without removing it and the rightful owner has no way to get it out or did not know of it in time to take it out before the mine is destroyed, it might be difficult to establish the value beyond what it had in its native bed. But where the coal has been removed by the trespasser to the mouth of the mine it had a value which is capable of being easily established that would seem to be the fair and just way to do so, and the trespasser has no right to complain of that mode being adopted.

Mt. Savage George's Creek Coal Co. v. Monahan, —— Md. ——, 104 Atlantic 480, p. 483.

METHOD OF DETERMINING DAMAGES.

The amount to be recovered for negligence in mining over the line is fixed by the worth of the coal when first dug, and the mode of reaching the value is through the price of the coal after it arrives at the pit's mouth, with a deduction for the cost of conveying it thither from the place where it was mined. This is said to be because it could have no value as a salable article without being taken from the pit, and that is the earliest moment at which the rightful owner could repossess himself of the coal. But it is not material whether the value of the coal at the mine's mouth be first ascertained and then an allowance be made for the bare expense in its simple conveyance thither, or whether a witness be asked to estimate directly its value just prior to its removal, as the rule of compensation is practically observed in either case.

Mt. Savage George's Creek Coal Co. v. Monahan, —— Md. ——, 104 Atlantic 480, p. 483.

LABOR ORGANIZATIONS.

REFUSING TO EMPLOY UNION MINERS.

A coal mining company is within its rights in refusing to employ union men and in discharging those who join a union, and the company is entitled to protection against unlawful invasions of such rights.

Tosh v. West Kentucky Coal Co., 252 Federal 44, p. 47.
See Hitchman Coal & Coke Co. v. Mitchell, 245 U. S. 29, 38 Supreme Ct. Rep. 65.

PERSUADING MINERS TO QUIT WORK.

Union miners have a right by peaceful methods to persuade other miners not to work in a nonunion mine; but they have no right to attempt such result by violence or intimidation.

Tosh v. West Kentucky Coal Co., 252 Federal 44, p. 47.

EFFORTS TO UNIONIZE MINERS—EFFECT OF FORMER DECREE—CONTEMPT OF COURT.

A decree entered in 1907 enjoining certain named persons and their associates from the use of threats, intimidation, force, or violence in order to induce or compel miners to cease working in a nonunion mine is not binding upon other and different members of the United Mine Workers in 1917, who by threats and intimidation attempted to induce the then employed miners to cease working in the nonunion mine. The decree of 1907 that effectually prevented the strike can not operate upon other and different persons 10 years later who attempted to bring about a wholly different and distinct strike, though the offending persons were members of the same union, and persons joining in the attempted strike of 1917 can not be punished as for contempt of court on a charge of violating the decree of 1907.

Tosh v. West Kentucky Coal Co., 252 Federal 44, p. 48.

PERSONS BOUND BY INJUNCTION.

A decree in proceedings by a coal mine operator to enjoin a strike enjoining certain named defendants "and all other persons whatsoever who may have acquired notice, information, or knowledge of this judgment" from in any manner interfering with, molesting, hindering, obstructing, or stopping any of the business of the coal mining and from compelling or inducing the company's employees by threats, intimidations, force, or violence to refuse or fail to do their work, is binding not only upon the particular persons named, but upon all persons participating in the acts charged and mentioned in the decree who have actual knowledge of the injunction; and all such persons may properly be punished as for contempt of court in violating the decree.

Tosh v. West Kentucky Coal Co., 252 Federal 44, p. 47.

MINING LEASES.

LEASES GENERALLY—CONSTRUCTION.

PARTITION OF ROYALTIES.

Royalty in oil brought to the surface is personal property and as such is susceptible to partition among the coowners.

Warren v. Boggs, —— W. Va. ——, 97 Southeastern 589, p. 592.

LEASE AND OPTION TO PURCHASE—NOTICE OF ELECTION REQUIRED.

The United States Gypsum Company leased certain lands for its operations from the Mackey Wall Plaster Company. The lease also contained an option to purchase the property with an agreement to give the lessor and optionor a notice in writing at least sixty days prior to a certain date if it decided not to avail itself of the option to purchase; but on failure to give such notice it would be obligated to make the purchase. A letter written prior to July 1, by the manager of the Gypsum Company to the lessor to the effect that later the company would give formal notice that it would not purchase the property, is not sufficient to comply with the terms of the lease and on failure to give the notice as required by the lease the Gypsum Company was bound by the contract to purchase.

United States Gypsum Co. v. Mackey Wall Plaster Co., 252 Federal 397, p. 399.

OPTIONEE TO PURCHASE AS LESSEE.

A person holding an option to purchase a mining claim, coupled with the right of possession under certain conditions stands in the position of a lessee and not a purchaser.

Nicholson v. Smith, —— Idaho ——, 174 Pacific 1008.

LANDS COMBINED FOR LEASING—TENANTS IN COMMON—RIGHT TO ROYALTIES.

Where the owners of several adjoining tracts of land combine them for the purpose of leasing them for mineral production and be united in a joint lease because the mineral could thus be mined and produced more economically than in separate tracts, the owners thereby made themselves tenants in common in the minerals and the royalties are to be distributed to the several owners proportionately.

Pittsburgh & West Virginia Gas Co. v. Ankron, —— W. Va. ——, 97 Southeastern 593, p. 594.

See Warren v. Boggs, —— W. Va. ——, 97 Southeastern 589.

RIGHT TO REMOVE IMPROVEMENTS—RECOVERY FOR VALUE.

A land owner by an oral contract leased certain lands to be held by the lessee during his life time. It was also orally agreed that the lessee should remove all buildings and improvements placed upon the lands or if left the lessor would pay such sum as they should be reasonably worth. The contract of leasing was within the statute of frauds and the lease could be terminated by the land owner, the lessor. But the agreement that the tenant should be allowed to remove the improvements or that he should be paid the value thereof is not a contract for any interest in land and is not invalid under the statute of frauds and on the termination of the lease by the lessor, the lessee was entitled to recover the value of the improvements.

Fredell v. Orman Min. Co., —— N. C. ——, 97 Southeastern 386, p. 387.

FORFEITURE—NOTICE REQUIRED—ASSIGNMENT BY LESSEE.

A lease of mineral lands provided for forfeiture under certain circumstances by serving written notice upon the lessee. The lessee after taking possession under the lease assigned a part of his interest to a third person as a subtenant or a subcontractor. The original lessee on a violation of the forfeiture provisions can not defend against a forfeiture on written notice duly given to him on the ground that the lessor did not serve a written notice on the subtenant or subcontractor.

West v. Brugger, —— Kan. ——, 175 Pacific 673, p. 674.

COMMENCEMENT OF OPERATIONS—EXTENSION OF TIME—EFFECT ON FORFEITURE CLAUSE.

A mining lease provided that operations should begin within forty days from its date and that a suspension of operations at any time for more than ten days gave the lessor the right to forfeit the lease. An extension by the lessor of the time for commencing the work did not amount to a waiver of the requirement that the work should not be suspended at any time for more than ten days. The fact that the lessor was willing to defer the beginning of operations does not imply a willingness to suspend operations for an indefinite period at the convenience or pleasure of the lessee.

West v. Brugger, —— Kan. ——, 175 Pacific 673, p. 674.

SUSPENSION OF OPERATIONS—FORFEITURE.

A mining lease provided that the lessee was to begin operations within 40 days from its date and not to cease work for more than 10 days at any time without the permission of the lessor, delays caused by unavoidable accidents or causes beyond the control of the lessee excepted. The lease also provided that on failure to prospect and develop the land within the time stated, or failure in any particular to carry out the provisions of the lease, the lease should become void and the lessor might declare the lease forfeited by written notice. The continuous prosecution of the work was obviously of large importance and the failure of the lessee to carry out any of the provisions of the lease gave the lessor the right to forfeit the lease by giving the required written notice.

West v. Brugger, —— Kan. —— 175 Pacific 673, p. 674.

ASSIGNMENT OF PART INTEREST—FORFEITURE—DEFENSE.

The lessee of a mining lease assigned and transferred a part of his interest to a subtenant or a subcontractor. Thereafter the original lessee subjected the part of the lease held by him to a forfeiture by a violation of its terms. The lessor declared that part of the lease forfeited, as provided in the lease, and thereupon made a new lease to the subtenant or subcontractor of the original lessee. In an action by the lessor to forfeit such part of the lease the lessee can not defend on the ground that his subtenant or subcontractor could not dispute or defeat his lessor's title, as this question could not be involved in an action between the lessor and the original lessee and to which the sublessee was not a party.

West v. Brugger, —— Kan. ——, 175 Pacific 673, p. 674.

LEASE OF STATE MINERAL LANDS—DISCRETION.

An applicant for a lease of State mineral lands for prospecting purposes, who has complied with the statute, the lands applied for being subject to such a lease, has a right to have the lease issued to him, and the State land commissioner has no discretion and on refusal may be compelled by mandamus to issue the lease.

State v. Savidge, —— Wash. ——, 175 Pacific 568, p. 569.

COAL LEASES.

CONSTRUCTION—ARBITRATION—CONDITION PRECEDENT.

The lease of a coal mine required the lessee, among other things, to mine and remove all workable coal, and provided that if the lessee should refuse to mine and remove the workable coal in any particular room after notice the lessee and the agent of the lessor should submit the question of available coal unmined to arbitrators to determine the amount of available merchantable coal remaining unmined; and if the lessee should then refuse to mine such coal he should pay the lessor a stipulated sum per ton as royalty, according to the report of the arbitrators. Under this provision the arbitration is a condition precedent to the right to maintain and prosecute a suit to recover compensation or royalty for any alleged merchantable and available coal left unmined.

Flavelle v. Red Jacket Consolidated Coal & Coke Co., —— W. Va.——, 96 Southeastern 600, p. 601.

CONSTRUCTION—AVAILABLE AND MERCHANTABLE COAL.

Under a coal-mining lease requiring the lessee to mine and remove all coal that was available, workable and merchantable, coal not available and not merchantable is not within the terms used to define what shall be mined.

Flavelle v. Red Jacket Consolidated Coal & Coke Co., —— W. Va.——, 96 Southeastern 600, p. 605.

CONSTRUCTION—RIGHT TO MINE NEW SEAM.

A coal-mining lease gave the lessee the right to mine a known seam of coal, and also gave the lessee the refusal of the right to mine any other seam or seams that the lessor might subsequently discover in the leased lands. The lease extended for a period of 30 years, and during the existence of the lease and while the lessee was properly mining coal from the known seam, there was discovered on an adjoining tract a new and underlying seam of coal that extended into or through the leased premises. The mere failure of the lessee to open and mine this new seam did not estop him from claiming the right to work the same and was not an abandonment of the right on the lessee's part to work the same on the ground that he had not worked the new seam prior to an attempt to work the new seam by a second lessee.

Standard Pocohontas Coal Co. v. New Pocahontas Coal Co., 252 Federal 535, p. 539.

AUTHORITY TO MINE SEPARATE SEAMS OF COAL.

A lease for mining a certain known seam of coal provided that if the lessor should discover any other seam of coal it should be offered the lessee upon the same terms, and if the lessee within six months from such offer did not elect to accept the offer to mine any such other discovered seam, the lessor could lease the same to any other person or corporation, subject to the rights of the lessee. This lease gave the lessee an unlimited grant for coal mining under the entire tract and was intended to give the lessee the right to work all other seams that might be discovered by the lessor during the period of the lease.

Standard Pocahontas Coal Co. v. New Pocahontas Coal Co., 252 Federal 535.

CONSTRUCTION—ROYALTIES APPLIED ON LESSOR'S DEBT—EFFECT OF LOSSES.

The owner of two mines, being largely indebted, leased them to a coal-mining company by which the latter agreed to operate the mines and finance the indebtedness of the owner and apply two-thirds of the net profits to the indebtedness of the lessor, the lessee receiving one-third of the net profits. Later, and by a supplemental lease, the lessee agreed to continue to operate the first mine and to provide the necessary capital to develop and equip and put in condition for operation the second mine, the lessor to afford the lessee the free use of all sidings, tipples, buildings, power plants, machinery, and equipment of the first mine, with the right to use and remove them to the second mine when the first was exhausted. The royalty due the lessor was to be paid on his indebtedness until it was satisfied. In addition to the payment of the indebtedness of the lessor the lessee was to pay the lessor a stated amount monthly. There is nothing in the lease to indicate that the lessor shall share in the losses, and the lease or agreement does not create a partnership relation. Under the lease the profits must be computed and divided at the periods stated without any deductions for losses sustained by the lessee in the preceding period.

Shrader v. Commercial Coal Min. Co., —— Pa. ——, 104 Atlantic 151.

EQUIPMENT OF MINE—ALLOWANCE BY LESSOR—CONSTRUCTION.

The lease of a coal mine required the lessee to develop and equip the mine and provide the necessary funds for that purpose. It stipulated that the expenditure for machinery and cost of development should include only labor and cost of material and personal property purchased for that purpose, but there should be no charge for general superintendence, management, or supervision; and that the total amount of the expenditure for such purpose should not exceed $25,000. All renewals or replacements of original equipment should be charged to the cost of production. The cost of the equipment of the mine to the amount of $25,000 was to be deducted from the share of the profits that was to be paid to the lessor until the indebtedness was paid. The lessee equipped the mine for operation at an expense of $20,000. Later the lessee reequipped the mine for operation by electrical power at an additional cost of $37,000. The electrical equipment was not purchased to replace worn-out machinery but because the lessee believed a more economic operation of the mine would result and the change was a question of business policy, but the lease did not intend to place within the power of the lessee without limitation to charge against profits the cost of an entire change in the equipment of the mine.

Shrader v. Commercial Coal Min. Co., —— Pa. ——, 104 Atlantic 151, p. 153.

CONSTRUCTION—MINIMUM ROYALTY—LIABILITY.

A lease of a coal mine required the lessee to mine during each year of the term of the lease not less than a certain stated number of tons until all of the merchantable and workable coal in the particular seam covered by the lease should be exhausted; and on failure to mine the stated number of tons, the lessee should pay the lessor the royalty on such stated amount at an agreed price per ton. There was no guarantee in the lease as to the quantity or quality of the coal or as to the thickness of the vein. Under the lease, so long as the mine was in operation, the minimum royalty must be paid, and the fact that the vein became lighter in places, or that the coal contained an unusual amount of dirt, rendering it difficult to secure miners to work and mine the coal, is no defense in an action to recover the minimum royalty.

Corona Coal & Coke Co. v. Dickinson, —— Pa. ——, 104 Atlantic 741, p. 742.

PAYMENT OF ANNUAL MINIMUM ROYALTY—FAILURE TO MINE DESIGNATED AMOUNT.

A coal lease required the payment of an annual minimum royalty whether the quantity of coal mined should produce that amount of royalty or not. The lessee ceased mining operations and gave notice thereof to the lessor, within a royalty period and without having mined within such period coal sufficient to yield such royalty; but he left unmined coal which the lease required him to mine. In such case he is chargeable with such share of the royalty as had accrued at the time of the notice, less the value of the coal mined during such period at the agreed rate per ton.

Flavelle v. Red Jacket Consolidated Coal & Coke Co., —— W. Va. ——, 96 Southeastern 600, p. 606.

MINIMUM ROYALTY—INCREASED COST OF MINING—ACCEPTANCE OF SMALLER SUM.

A coal mining lease required the lessee to mine a certain amount of coal annually and to pay the royalty on such amount whether mined or not. The subsequent mining operations became more difficult and more expensive and the lessee failed to mine the stipulated amount. The fact that the lessor received and accepted the royalty on the amount of coal actually mined was not a waiver on his part of the balance due nor did it estop him from claiming the full amount due.

Corona Coal & Coke Co. v. Dickinson, —— Pa. ——, 104 Atlantic 741, p. 742.

MINIMUM ROYALTY—CHANGE IN QUALITY OF COAL—LIABILITY.

A lessee in a coal-mining lease who obligated himself to pay a stipulated royalty on a stated amount of coal to be mined annually, and whether mined or not, can not avoid the payment because of inconvenience, or the cost of compliance, though these may make compliance a hardship, but they can not excuse him from the performance of an absolute and unqualified undertaking to do a thing that is possible and lawful. The lease is not invalid nor is the lessee in any manner discharged from its binding effect because it turned out to be difficult or burdensome to perform. The fact that the vein of coal to be mined became lighter or thinner, or that the coal contained an unusual amount of dirt, did not discharge the lessee from his obligation.

Corona Coal & Coke Co. v. Dickinson, —— Pa. ——, 104 Atlantic 741, p. 742.

DEFINITE ROYALTIES—FAILURE TO MINE STATED AMOUNT.

Where a lessee covenants to mine a certain quantity of mineral or coal during a fixed period of time or to pay a definite rental or royalty in event he fails to do so, and he is not exonerated therefrom by some other stipulation of the lease, he will generally be held to a strict performance of the covenant.

Flavelle v. Red Jacket Consolidated Coal & Coke Co., —— W. Va. ——, 96 Southeastern 600, p. 605.

GRADES OF COAL—METHODS OF DETERMINING.

A coal-mining lease required the lessee to mine and remove all available, workable, and merchantable coal and to pay a certain stipulated royalty per ton on the best grade of coal and another stipulated royalty per ton for slack, if a market therefor was found. In determining what coal is not within the meaning of the terms of the lease, the important elements are its location and condition in the mine and the disproportionate difference between the cost of mining operations therefor and the profits to be derived therefrom if mined and sold. If this difference is such as to deter an ordinarily prudent and practical operator from mining the coal, then such coal is not within the meaning of the descriptive terms of available, workable, and merchantable coal.

Flavelle v. Red Jacket Consolidated Coal & Coke Co., —— W. Va. ——, 96 Southeastern 600, p. 605.

USE OF TIMBER FOR MINING—SPECIFIED SIZES—DATE OF MEASUREMENT.

A coal-mining lease gave the lessee, the mine operator, the right to take and use for mining purposes on the leased land so much of the timber thereon, with certain exceptions, not over twenty inches in diameter one foot from the ground as should be required for such purposes. The lease conferred a mere right to cut and use timber not over twenty inches in diameter as the mine operator should need in the progress of mining operations. Nothing but necessity for such use justified the taking of any of the timber and therefore the size of the timber to be so taken was determinable as of the dates of necessity for its use. The lease did not purport to vest title to any timber as of its date and the grantee could not during a period of 17 years claim and cut timber that was of the specified diameter at the date of the lease. The grant was one of mere license to cut and use certain classes of timber for specified purposes and the limitation as to the size applied at the time the necessity for cutting arose.

Raleigh Coal & Coke Co. v. Mankin,—— W. Va. ——, 97 Southeastern 299, p. 300.

See Godfrey v. Weyanoke Coal & Coke Co., —— W. Va. ——, 97 Southeastern 186, p. 189.

FAILURE TO PAY ROYALTIES—CANCELLATION OF LEASE—ROYALTIES DUE AFTER SUIT.

The lessor of a coal lease brought suit to cancel the same upon the ground that the lessee had failed to pay the minimum royalty due and had committed waste upon the leased premises. The action was commenced on November 26, 1915, and by the terms of the lease the minimum royalty for the year 1915 was not due until January 15, 1916. There had been no default in the payment of the annual royalties at the time the suit was filed. The lessee can not be held accountable for failing or refusing to do anything under the contract after the suit was commenced for the cancellation of the contract. At the time of the institution of the suit there was due to the lessor on monthly royalties the small sum of about $50 and payment of this amount had been provided for. The lessor can not maintain an action for forfeiture or cancellation of the lease for the nonpayment of royalties due and payable after the commencement of the action.

Continental Fuel Co. v. Haden, —— Ky. ——, 206 Southwestern 8, p. 10.

FORFEITURE—FORFEITURE CLAUSE—ENFORCING.

The parties to a coal-mining lease for a term of years may lawfully provide for its forfeiture for the breach of the lessee's covenants or the conditions contained in the lease; and while courts abhor forfeitures they will not hesitate to give effect to such provisions when clearly provided for by the parties and where the conditions are clearly violated.

Continental Fuel Co. v. Haden, —— Ky. ——, 206 Southwestern 8, p. 10.

FORFEITURE—ABSENCE OF FORFEITING CLAUSE—REMEDY AT LAW.

A forfeiture of a coal-mining lease will not be decreed for a breach of the terms of the lease in the absence of a forfeiting clause, but the parties will be left to their legal remedies for damages for any alleged breach of the lease.

Continental Fuel Co. v. Haden, —— Ky. ——, 206 Southwestern 8, p. 10.

MINIMUM ROYALTY—DEVELOPMENT OF MINE—FORFEITURE OF LEASE.

A coal-mining lease provided that the lessee should pay to the lessor a royalty of 2 cents per ton on all coal mined, or he should pay at least the sum of $1,200 per annum as royalty whether sufficient coal should be mined to produce that sum at the royalty rate or not. The lease bound the lessee to develop the mine to a daily capacity of 500 tons within two years and thereafter to mine not less than 60,000 tons of coal per annum. The parties thus agreed upon the minimum royalty to be paid by the lessee and to be accepted by the lessor; and if the lessee should pay the stipulated royalty without taking out any coal the lessor could not be damaged under the contract, as he would be receiving his royalty and retaining the coal. Under such circumstances the failure to mine and remove the specified amount of coal, or any amount of coal, can not be made the basis of an action by the lessor to forfeit or cancel the lease on the ground of waste.

Continental Fuel Co. v. Haden, —— Ky. ——, 206 Southwestern 8, p. 10.

WASTE—REMEDY.

Section 2328 of the Kentucky statute provides that if a tenant for life or years shall commit waste during the term of anything belonging to the tenement without license in writing he shall be subject to an action in waste, shall lose the thing wasted, and pay treble the amount at which the waste shall be assessed. This section is based upon the old English statutes and provides a remedy for forfeitures and damages in cases of voluntary waste. There is an obvious and well recognized distinction between voluntary waste which consists in the commission of some destructive act and permissive waste consisting in omission by a tenant for life or years to keep the premises in proper repair. That the statute was intended to authorize an action for voluntary waste and not for permissive waste is clear and leaves permissive waste to be dealt with in equity.

Continental Fuel Co. v. Haden, —— Ky. ——, 206 Southwestern 8, p. 12.

WASTE—EQUITABLE RELIEF—FORFEITURE.

The lessor in a coal-mining lease brought an action for forfeiture and to have the lease canceled on the ground of waste because of the alleged failure of the lessee to develop the mine and to mine the stipulated number of tons of coal per annum. But the rule of law is that forfeiture is no part of the equitable relief afforded in cases of waste. A court of equity will not lend its aid actively to enforce a forfeiture, but will leave the parties to their legal remedies.

Continental Fuel Co. v. Haden, —— Ky. ——, 206 Southwestern 8, p. 12.

EQUITABLE WASTE—INJUNCTION TO PREVENT.

A court of equity will restrain equitable waste alleged to have been committed under a coal-mining lease only when it is shown that the lessee has been guilty of a wanton and unconscientious abuse of his rights, ruinous to the interests of the lessor. Under this rule a court of equity will not forfeit a mining lease on the ground of equitable waste on the part of the lessee in failing to mine the quantity of coal specified where the minimum royalty provided for was paid, which equaled the ton royalty of the amount stipulated to be mined, and where the lessee in conducting his mining operations had placed improvements in the mine and upon the leased premises to the extent in value of $100,000.

Continental Fuel Co. v. Haden, —— Ky. ——, 206 Southwestern 8, p. 10.

OIL AND GAS LEASES.

CONSTRUCTION AND VALIDITY.

An oil and gas lease contained a provision to the effect that the lessee was to have "first choice on other drilling at price paid in the Healton field by reliable operators." The terms of this provision are so indefinite and lacking in mutuality as to render it ineffective, and no action for the recovery of damages can be based on an alleged breach of this provision of the contract.

Emery Bros. v. Mutual Benefit Oil Co., —— Okla. ——, 175 Pacific 210, p. 211.

CONSTRUCTION—COMMENCEMENT OF OPERATIONS.

An oil and gas lease dated May 14, 1912, provided that a test well should be commenced within 5 miles of the leased premises before September 1, 1912. The lease further provided that a well should be commenced on the leased premises "within two years of said date," or that certain stated rentals were to be paid in lieu of development. Under the terms of the lease the well on the leased premises was to be commenced or rentals paid from September 1, 1912, and not from the date of the lease.

Southwestern Oil Co. v. McDaniel, —— Okla. ——, 175 Pacific 920, p. 921.

PRACTICAL CONSTRUCTION—TIME FOR PAYMENT OF RENTALS.

An oil and gas lease was dated May 14, 1912. The lease provided that a certain test well was to be drilled, not upon the premises, before September 1, 1912, and that a well was to be commenced on the leased premises "within two years of said date or rentals paid for delay." In the construction of this clause of the lease by a court the construction placed thereon by the parties before any controversy arose between them is entitled to great consideration. Rentals had been paid and accepted on the theory that they were due on September 1 and not May 15. The plaintiff in his original petition alleged that he had declined to accept the rentals which came due on September 1, 1916. By their conduct the parties construed this provision as meaning the rentals were due and payable on September 1 each year, and this conduct does not conflict with the meaning of the language used and must be given effect.

Southwestern Oil Co. v. McDaniel, —— Okla. ——, 175 Pacific 920, p. 921.

CLASSES—"UNLESS LEASE"—TERMINATION.

Most of the oil and gas leases fall into two classes commonly designated as the "or lease" and the "unless lease." The leases belonging to these respective classes possess such marked distinctions in the rights and liabilities of the parties that these distinctions should not be lost sight of in the construction of such a lease. Under an "unless lease" the lessee, so long as he pays the rentals in the manner provided, has an option to continue the lease in force. Such a lease is subject to termination at the will of the lessee, and the privilege may be exercised by a mere failure to pay the stipulated rental at the time due and upon which the lease automatically terminates, and the lessor can not sue under the lease for the rentals; but under such a lease the lessor has not the right to terminate the lease so long as the lessee complies with its terms.

Northwestern Oil & Gas Co. v. Branine, —— Okla. ——, 175 Pacific 533, p. 535.

CLASSES—"OR LEASE"—TERMINATION—RIGHTS OF PARTIES.

Under an "or lease," even when containing a surrender clause, the payment of rentals by the lessee as required is not necessary to keep it alive from time to time, nor does the failure to pay automatically terminate the contract, as under an "unless lease;" and where the lessee makes default in the payment of rentals the lessor may waive the forfeiture clause and sue and recover rentals due according to the lease. The lessee may terminate the lease at any time by availing himself of the right to do so contained in the surrender clause and by paying all the accrued rentals due at the time of surrender.

Northwestern Oil & Gas Co. v. Branine, —— Okla. ——, 175 Pacific 533, p. 535.

RIGHT TO USE OF EXISTING WELLS.

An oil and gas lease granted to the lessee the land described for the purpose of mining and operating for oil and gas and laying pipe lines, building tanks and structures thereon necessary to take care of the oil. The lease was to remain in force for 10 years and as long thereafter as oil or gas was produced. The lessee was to deliver in a pipe line to the credit of the lessor, free of cost, one-eighth of all oil produced and to pay the lessor one-eighth of all sums received from the sales of gas, and to give the lessor free use of gas for fuel, and to pay the lessor for gas used off the premises $50 per year, payable three months in advance. The lessee agreed to complete a well within one year or pay $160 for each additional year the completion was delayed, and such payment on the completion of the wells should operate as a liquidation of all rent under this provision. The lessee was to have the right to use free of cost, gas, oil, or water produced on the premises for its operations thereon, except water from the wells of the lessor. The lessee was not to be bound by any change in the ownership of land until duly notified thereof. The language of the lease did not restrict the gas or oil rights granted. The lease granted to the lessee the right to operate a gas well that was in existence at the time the lease was executed, and under the lease the lessor, the land owner, could make no claim for damages for gas taken from such existing well.

Southwestern Oil Co. v. McDaniel, —— Okla. ——, 175 Pacific 920, p. 922.

VALIDITY—PRIORITY OF FIRST LEASE RECOGNIZED.

A husband and wife executed an oil and gas lease on a certain tract of land owned by them. After the death of the husband the wife as the sole owner executed a second lease on the same land. The lessee of this second lease refused or failed for some reason to enter upon the land and produce oil and gas under the authority of the lease. After the termination of such second lease the surviving wife as the owner conveyed by deed the oil and gas rights in the land, and therein expressly recognized the existence and the validity of the first and original lease executed by the husband and wife. This she had the power to do and this established the validity of such original lease.

Snodgrass v. Koen, —— W. Va. —— 96 Southeastern 606, p. 607.

EXECUTION AND VALIDITY—FORMER ADJUDICATION—ESTOPPEL.

The effect of the execution and the validity of an oil and gas lease was determined in an action between the parties and that the lease was a legal and binding obligation. These questions having been litigated and settled in a former suit between the same parties can not be relitigated in a subsequent action. The estoppel created by the former proceedings is not confined to the judgment alone but extends to all facts involved in it as necessary steps or as the basis upon which it must have been founded.

Uncle Sam Oil Co. v. Richards, —— Okla. ——, 175 Pacific 749.
See Uncle Sam Oil Co. v. Richards, —— Okla. ——, 158 Pacific 1187.

CONSIDERATION—CASH BONUS—MUTUALITY.

An oil and gas lease provided that the lessee should commence the drilling of a well within twelve months from its date or pay a quarterly rental of $40. It also provided that the lessee might at any time on the payment of the further sum of $2 and as accrued liabilities, surrender the leased premises, and terminate all future liabilities under the lease. A cash bonus of $160 was paid by the lessee for the privilege of the lease. The bonus was a sufficient consideration to support each and all of the coveneants of the lease, and the presence of the surrender clause did not render the lease void for want of mutuality nor did it confer on the lessor the right to terminate the lease at will.

Northwestern Oil & Gas Co. v. Branine, —— Okla. ——, 175 Pacific 533, p. 534.
Pucini v. Baumgarner, —— Okla. ——, 175 Pacific 537.
Southwestern Oil Co. v. McDaniel, —— Okla. ——, 175 Pacific 920, p. 922.

VALIDITY AND PRIORITY—TITLE OF LESSOR—ADVERSE POSSESSION.

An adult son took possession of land purchased by his father under a title bond, claiming that the land was intended for him as a gift. He occupied and improved the land, paid the balance of the purchase price due under the bond, and after some six years "turned over" the land to his mother, who continued to occupy and improve the land under claim of ownership and title for a period of more than 25 years, executing leases for the privilege of mining coal under the land, and finally disposed of the land by will. The husband and father after an absence of more than 30 years returned, claimed the land, and executed an oil and gas lease thereon. The devisee in possession of the land also executed an oil and gas lease on the land. The lease executed by the devisee gave to his lessee the prior and superior right to operate the land for oil and gas on the theory that the son and the mother through him acquired title to the land by adverse possession as against the father and husband.

Big Blaine Oil & Gas Co. v. Yates, —— Ky. ——, 206 Southwestern 2, p. 4.

LEASE OF HOMESTEAD—ASSENT OF WIFE—ESTOPPEL.

An oil and gas lease on a homestead for the purpose of drilling and operating generally for oil and gas, requires the assent of both husband and wife. But the assent of the wife to such a lease can not be implied, nor can it be validated on the ground of estoppel where the wife, with knowledge that the execution of such a lease was contemplated, went with her husband to a bank and remained a part of the time while the execution of the lease was discussed, but was not present at the time the lease was in fact executed, and the consideration paid was credited on the indebtedness of the husband to the bank and where during the conversation the wife stated to the husband that she did not want the land leased.

Carter Oil Co. v. Popp, —— Okla. ——, 174 Pacific 747, p. 748.

LEASE OF HOMESTEAD—CONSENT OF HUSBAND AND WIFE.

An oil and gas lease on land occupied as a homestead which granted the right to enter upon and operate the same for oil and gas, together with the right to lay pipe lines, erect power houses, stations, and fixtures necessary for the production of oil and gas, is such a grant of the use and occupancy of the homestead as requires the joint consent of the husband and wife, and an oil and gas lease executed by the husband alone is invalid.

Carter Oil Co. v. Popp, —— Okla. ——, 174 Pacific 747, p. 748.

OPTION CONTRACT—MUTUALITY AND VALIDITY.

The fact that a contract in the nature of an oil and gas lease may constitute an option is not sufficient to make it unilateral, as it is the essence of an option contract that it is not mutual. The optionee pays his money or performs his promise for the right of electing whether he will require performance by the other party, and the optionor relinquishes his right of choice after the consideration is received by him. An oil lease that by its terms granted to the lessee an estate in possession which vested immediately on its execution and delivery and under which the lessee had the right, according to its terms, for a period of five years to make exploration on the leased premises, does not lack mutuality and can not be avoided by the lessor where he had received and accepted a cash bonus and where four successive quarterly payments had been tendered by the lessee in strict conformance with the terms of the lease.

Northwestern Oil & Gas Co. v. Branine, —— Okla. ——, 175 Pacific 533, p. 534.

SURRENDER CLAUSE—EFFECT ON VALIDITY.

The fact that an oil and gas lease contained a surrender clause whereby the lessee might, on the payment to the lessor of the sum of $2, surrender the lease and relieve himself from future liability did not render the lease unilateral and voidable for want of mutuality and authorize the lessor to terminate the lease at will where a cash bonus was paid for the lease and quarterly or annual rentals were to be paid in lieu of or on failure of the lessee to commence drilling.

Northwestern Oil & Gas Co. v. Branine, —— Okla. ——, 175 Pacific 533, p. 534.

OPTION AND SURRENDER CLAUSE—WAIVER BY LESSEE.

An oil and gas lease contained the usual surrender clause and contained this further provision: "This surrender clause and the option herein reserved to the lessee shall cease and become absolutely inoperative immediately and concurrently with the institution of any suit in any court of law or equity by the lessee to enforce this lease or any of its terms." Such a provision is valid and binding, and when the lessee filed a suit to enjoin the lessor from re-leasing the premises and further interfering with his rights under the lease the surrender clause became inoperative and the lessee thereby became bound to perform the covenants of the lease and is entitled to be protected in his rights under the lease.

Pucini v. Baumgarner, —— Okla. ——, 175 Pacific 537, p. 538.

ANNUAL BONUS FOR OIL WELLS—PROOF OF REQUIRED PRODUCTION.

A lessee in an oil and gas lease covenanted to pay an annual bonus of $50 for each oil well producing five or more barrels a day. An action by the lessor to recover the bonuses provided for can not be maintained without proof of the fact that the wells drilled or in operation produced five or more barrels per day on an average and of the length of time that the wells produced such average amount.

Moherman v. Anthony, —— Kan. ——, 175 Pacific 676, 678.

DELAY IN DEVELOPMENT—EXPRESS AND IMPLIED COVENANTS.

In an oil and gas lease the question of delay in development was expressly covered by the terms of the lease for a consideration good at law and satisfactory to the parties, and the law does not render such an agreement unenforceable when fairly entered into. No implied covenant for development has ever been permitted to stand against such an expressed agreement, and the acceptance of stipulated rentals for delay is treated as full compensation for delay during the period for which the rentals were paid and received.

Southwestern Oil Co. v. McDaniel, —— Okla. ——, 175 Pacific 920, p. 922.

DEVELOPMENT POSTPONED—CONSIDERATION—SURRENDER CLAUSE.

Where no cash bonus or other consideration is paid for an oil and gas lease, development would be the sole consideration for the lease; but where a substantial bonus was paid it is sufficient to postpone development upon payment of the stipulated rental in conformity with the covenants of the lease. The payment of a substantial cash bonus is a sufficient consideration to support a surrender clause in favor of the lessee, and a surrender clause in such a lease does not render it void for want of mutuality and does not confer on the lessor the right to terminate the lease at will.

Northwestern Oil & Gas Co. v. Branine, —— Okla. ——, 175 Pacific 533, p. 535.
See Pucini v. Baumgarner, —— Okla. ——, 175 Pacific 537.

EXTENT OF DEVELOPMENT DETERMINED.

In an action to cancel an oil and gas lease on the ground of a breach of an implied covenant to drill the lessee oil company in its answer and by a statement of its counsel in open court offered to abide by the decision of the court as to the amount of development that should be made on the leased land. The finding and decree of the court was that the oil company should drill two additional wells or pay $50 per annum each in lieu of the drilling of such wells, and if neither of these things were done the lease should be cancelled. The judgment rendered was invited by the lessee and was, in fact, in its favor and it was not prejudiced thereby and can not complain.

Blackwell Oil & Gas Co. v. Whitesides, —— Okla, ——, 174 Pacific 573, p. 575.

PRODUCTION OF GAS ONLY—FAILURE TO DEVELOP—CANCELLATION.

The same equitable principle as to the cancellation of an oil lease for breach of an implied agreement to develop applies to a condition where a well drilled on the leased premises, even though the royalty for gas was a stipulated sum per annum for each well. But on the failure of the lessee to develop, equity affords the only adequate remedy for relief, and the lessee must reasonably and fairly develop the land or surrender the lease.

Blackwell Oil & Gas Co. v. Whitesides, —— Okla. ——, 174 Pacific 573, p. 574.

DELAY IN PAYMENT OF RENTAL—CANCELLATION PREVENTED.

An oil and gas lease provided that if an oil well was not commenced within one year the lease should be void unless the lessee should pay a rental of $80, payable quarterly in advance, payment to be made by cash or check to the lessor or to be deposited in a certain named bank. The lessee forwarded a check by registered letter in time to reach the lessor on November 28, but by reason of delay in the mail it was not received until December 5. The lessor by suit attempted to have the lease canceled. The lessee manifested no intention to abandon his right under the lease, and attempted to make the payment before the stipulated time, and it was not through any act of his that the payment did not reach the lessor in ample time. Under the circumstances it would be inequitable to grant the relief prayed for and cancel the lease.

Kays v. Little, —— Kan. ——, 175 Pacific 149.

INTEREST OF LESSEE—PROOF BY PAROL.

A contract, or an ordinary oil and gas lease, permitted the lessee for a term of years to go upon the land described to prospect for oil and gas, mine and operate tanks, power stations, and oil and gas pipe lines upon a royalty basis. Such an agreement or lease conveys no interest in nor does it create any incumbrance upon the land, or in oil or gas found therein, and the land is still to be considered in the possession of the grantor. The contract amounts only to a license entitling the licensee to search and dig for oil and gas according to the terms of the grant and to appropriate the products to his own use on payment of the royalty provided for. Such an instrument creates an incorporeal hereditament, a right issuing out of or concerning the land, and establishes a mere chattel interest in no manner under the proscription of any rule, statutory or otherwise, against conveyances or incumbrances of real estate or other interests except by writing. Under such agreement or lease the real beneficiary owner of such property right may be shown by parol.

Wallawalla Oil, Gas & Pipe Line Co. v. Vallentine, —— Wash. ——, 174 Pacific 980, p. 981.

TITLE TO OIL AND GAS.

The lessors in an existing oil and gas lease by deed granted all the royalty interest in the oil and the rentals from gas wells, and conferred upon the grantee exclusive authority to drill for oil and gas after the termination of the prior lease. The deed vested in the grantee the fee simple title to the oil and gas in place in the land.

Snodgrass v. Koen, —— W. Va. ——, 96 Southeastern 606, p. 607.

GRANT OF OIL AND GAS—SURFACE AND MINERALS NOT SEVERED.

An oil and gas lease granted to the lessee all the oil and gas and mineral in and under certain described premises, with the right to enter thereon for the purpose of drilling or operating for oil, gas, or minerals, and to erect necessary buildings, structures, pipes, and machinery necessary for the production and transportation of oil and gas or minerals. This lease under the statute of Kansas (General Statutes 1915, sec. 11, 280) does not operate to sever and convey as real estate subsurface mineral deposits.

Hover v. McNeil, —— Kan. ——, 175 Pacific 150.

SEPARATION OF OIL AND GAS RIGHTS BETWEEN LESSEES—RIGHTS OF LESSOR.

The lessees under an oil and gas lease by an agreement separated the gas and oil rights, one taking the gas and the other the oil. Each agreed to interfere as little as practicable with the interests of the other.

Among other things it was agreed that no oil well should be drilled closer than 1,000 feet to any gas well so long as the same was producing one quarter million cubic feet per day. The original lease did not contain any 1,000-foot restriction and as against the land owner, the lessor, such a restriction and agreement between the lessees can not be enforced. The lessor, the land owner, had the right to the proper development of the property without regard to the agreement between the lessees and an injunction to prevent the drilling of a well within the alleged prohibited restriction should not be granted in violation of the rights of the lessor.

Arnold v. Garnett Light & Fuel Co., —— Kan. ——, 174 Pacific 1027, p. 1028.

UNAUTHORIZED SALE OF LEASE—RIGHTS OF LESSOR—RECOVERY.

A land owner executed an oil and gas lease on 80 acres of land; the lease was to remain in force for five years, and as long thereafter as oil and gas should be produced. The lessee bound himself by the lease to give a yearly bonus of $50 for each well producing five or more barrels of oil per day. The lease also provided that it was transferable only by consent of the lessor, and if sold the lessor was to receive one-half of the consideration received therefor. The lessee subsequently and without the consent of the lessor sold the lease, together with several others and a large amount of property for the bulk consideration of $65,000. There was no separate consideration for the lease in controversy. Under the facts, the lessor could not maintain an action to recover one-half of the bulk consideration, as the identity of the lessor's property had not been lost or destroyed, and the doctrine of confusion of goods had no application. The lessor under the facts stated was entitled to recover his share of the value of the lease at the time of the sale.

Moherman v. Anthony, —— Kan. ——, 175 Pacific 676.

WRONGFUL SALE BY LESSEE—ESTOPPEL TO DENY—INVALIDITY.

An oil and gas lease provided that it should be transferrable only by consent of the lessor, and if sold the lessor was to receive one-half of the consideration. The lease also provided that if a second well drilled within six months of the first drilling should not be a producing well the lease should revert to the lessor. The second well was not a producing well but other producing wells were subsequently drilled. The lessee sold and assigned the lease without the consent of the lessor. In an action by the lessor to recover one-half of the consideration received, pursuant to the terms of the lease, the lessee is estopped from asserting that because of the failure of the second well to be a producing well the lease reverted to the lessor.

Moherman v. Anthony, —— Kan. ——, 175 Pacific 676, p. 678.

SALE OF GAS BY LESSEE—OBLIGATION OF LESSEE TO LESSOR.

A lessee under an oil and gas lease contracted with a third person to sell him for gasoline purposes, and to be manufactured into gasoline, all gas produced from certain oil wells on the leased premises. In the absence of words indicating an intention to restrict his right to develop and exploit the oil field, the lessee did not debar himself from the use of such means as science and experience have proved to be advantageous in the production of oil, although as a result thereof the flow of gas was decreased and the gas lost some of its gasoline properties, to the loss and damage of the purchaser of the gas.

Beeson v. Drake Oil Co., —— W. Va. ——, 27 Southeastern 414, p. 415.

FORFEITURE—JURISDICTION OF EQUITY.

A court of equity has jurisdiction to decree the forfeiture of an oil and gas lease on the ground of a breach of an implied covenant to diligently operate and develop the leased premises, where such forfeiture will effectuate justice. The lessor is not limited to an action for damages because of such a breach of an oil lease where the measure of damages is uncertain, vague and indefinite.

Blackwell Oil & Gas Co. v. Whitesides, —— Okla. ——, 174 Pacific 573.

RIGHT TO DECLARE FORFEITURE—WAIVER.

A lessor in an oil and gas lease after cause for forfeiture accrued failed to notify the lessee of his intention to avoid the lease and thereafter accepted rentals in lieu of development. This conduct on the part of the lessor was a waiver of his right to a forfeiture of the lease.

Southwestern Oil Co. v. McDaniel, —— Okla. ——, 175 Pacific 920, p. 921.

SUIT TO QUIET TITLE—INSUFFICIENT PROOF—AMENDMENT.

In an action to quiet title to certain oil and gas lands the court entered judgment against the plaintiff, but permitted him to file an amended petition and to foreclose a contract of purchase, in the nature of a mortgage upon the land in controversy. The amended petition showed an agreement by a former owner of the land to convey the premises to the complainant and that there was a large sum due upon the contract; but there was nothing in the amended petition to show what interest the defendants had or claimed in the land or to show that they had become interested in the contract for the deed or had assumed the liability imposed by the contract. Under the circumstances of the case and upon the trial the former proceedings could not be referred to in aid of the amended petition as an amended pleading supersedes the original and the latter can not be looked upon as defining the issues.

Wyatt v. State Line Oil & Gas Co., —— Kan. ——, 175 Pacific 596.

SPECIFIC PERFORMANCE—RULE IN EQUITY.

Specific performance may be waived in that class of contracts and in oil and gas leases, in which one party was not originally bound or against whom the equitable remedy could not be obtained where such party by his subsequent acts, omissions or assent waives the objection of want of mutuality and places himself in a position that performance by him may be compelled; and in such case he may thereafter claim and enforce specific performance against the other party. The filing of the bill and the tender of performance supplies the want of mutuality.

Pucini v. Baumgarner, —— Okla. ——, 175 Pacific 537, p. 538.

INJUNCTION—LEGAL AND EQUITABLE RIGHTS.

An injunction to prevent an alleged trespasser from drilling oil wells and appropriating and removing oil from the premises in controversy in effect permits the complainant to drill for, remove and market the oil from the land in dispute. If the complainant has no legal title to the land as claimed by the defendant and the defendant has in fact a duly approved oil lease from the rightful owner, the injunction might work an injustice to such lessee and the owner, but for the fact that the courts have ample authority to safeguard their interest if in a proper proceeding a probability of recovery is shown.

Collier v. Bartlett, —— Okla. ——, 175 Pacific 247, p. 250.

PARTITION OF LAND SUBJECT TO LEASE—DIVISION OF ROYALTIES.

A tract of land covered by an oil and gas lease was subdivided in a proceeding in bankruptcy and each subdivision sold separately by the trustee to different purchasers. The purchasers of these respective parcels of land from the trustee bought all of the estate therein subject only to the right of the oil and gas lessee to explore for and produce the oil and gas. This right conferred upon the lessee is the same as would have existed in the different purchasers had there been no lease and from this it follows that the purchasers of each subdivision is entitled to the royalties on all of the oil produced from wells drilled on his subdivision and royalties from the oil or gas must be paid to the owner of the subdivision upon which the wells are drilled from which the production is had.

Pittsburgh & West Virginia Gas Co. v. Ankron, —— W. Va. ——, 97 Southeastern 593, p. 594.

See Osborn v. Arkansas Territorial Oil & Gas Co., 103 Ark. 175, 146 Southwestern 122.

Fairbanks v. Warrun, 56 Ind. App. 337, 104 Northeastern 983, 1141.
Ohio Natural Gas Co. v. Ullery, 68 Ohio St. 259, 67 Northeastern 494.
Wettengel v. Gormley, 160 Pa. 559, 28 Atlantic 934, 40 American State 733.
Campbell v. Lynch, 81 W. Va. 374, 94 Southeastern 739.

INDIAN LANDS.

APPOINTMENT OF GUARDIAN—RIGHTS OF LESSEE.

An Indian woman executed and delivered to a named lessee an oil and gas lease upon lands owned by her. Subsequently the lessor was adjudged incompetent and a guardian appointed for her person and estate. The order declaring the lessor incompetent did not purport to adjudicate any right claimed by the lessee nor did it effect his interest; but the sole question in the proceedings was as to the competency of the lessor. Under such circumstances the lessee in the oil and gas lease had no right to appeal from the order appointing the guardian.

Fixico, In re, —— Okla. ——, 175 Pacific 516.

OIL AND GAS LEASE AS CONVEYANCE—VALIDITY—APPROVAL BY COURT.

An oil and gas-mining lease executed February 11, 1915, by a full blooded heir of a deceased Creek Indian allottee is a conveyance of an interest in the land and is void unless approved by the court having jurisdiction, as required by section 9 of the act of Congress of May 27, 1908, (35 stat., 315).

Hoyt v. Fixico, —— Okla. ——, 175 Pacific 517.

LEASE BY GUARDIAN—PERIOD OF DURATION.

An oil and gas mining lease of lands owned by a full-blooded heir of a deceased Creek Indian allottee executed by a guardian of a minor full-blooded heir of the deceased allottee on March 2, 1912, for a period of years extending beyond the minority of the ward is valid where the lease was approved by the county court having jurisdiction of the settlement of the estate of the deceased allottee.

Hoyt v. Fixico, —— Okla. ——, 175 Pacific 517, p. 518.

LEASE OF RESTRICTED LANDS—CONTROL OF PROPERTY—TRUST—TAXATION.

The Act of Congress of May 27, 1908 (35 stat., 312), provides for the leasing of the restricted lands of Indian allottees for oil and gas purposes with the approval and under rules and regulations approved by the Secretary of the Interior. These rules provide for the payment of the royalty to the Secretary for the use and benefit of the allottee, but there is nothing in the statute which contemplates control of the property for which the fund is expended. There is nothing in the statute indicating any intention of Congress to empower the Secretary of the Interior to impose restrictions or to hold in trust, lands purchased for an allottee with oil royalties accruing from his allotment. The fact that the royalties while in the hands of the Secretary are held as a trust fund and therefore not taxable is not sufficient to impress the land with any such trust so as to relieve it from taxation by the State.

Hones v. Whitlow, —— Okla. ——, 175 Pacific 753.

MINING PROPERTIES.

TAXATION.

VALUATION OF TAXABLE PROPERTY—NOTICE—DUE PROCESS OF LAW.

On a hearing as to the increase in valuation of certain mining property the matter was referred to one member of the board of equalization for a report. The member after the hearing reported a certain valuation to the full board, but the board rejected such valuation and fixed a higher valuation on the property without notice to the owner of such rejection. After the increased valuation was placed upon the property notice was given the owner of the increase and in such case the statute gave the owner the right to have the valuation corrected on appeal, but this he failed to do. Neither the statute nor the action of the board of equalization denied the property owner the due process which the constitution guarantees.

Empire Min. Co. v. Bowers, —— Ala. ——, 79 Southern 561, p. 563.

PRESUMPTION AS TO VALUE.

A deed for land reserved to the grantor all coal and iron and minerals on or under the land including the oils of all kinds and the right to enter upon the land for the purpose of mining such minerals. Where such a reservation is made it will be presumed that the minerals mentioned and the right to mine the same are of some actual value for the purpose of assessment and taxation.

Colby, In re, —— Iowa ——, 169 Northwestern 443, p. 444.

MINERALS—OWNERSHIP—ASSESSMENT FOR TAXES.

When the fee in minerals has been separated from the fee in the surface, the fee or interest in the minerals is assessable and taxable to the owner thereof as real estate under the statute of Iowa.

Colby, In re, —— Iowa ——, 169 Northwestern 443, p. 444.

RESERVATION OF COAL—SPECULATIVE VALUES.

The owner of 160 acres of land sold and conveyed the same but reserved therefrom all coal and other minerals beneath the surface. In the matter of the assessment of the coal for taxation such proceedings were had that the coal rights were assessed for taxes at $2,000. No mine had been opened, and no coal of that reserved had been worked or mined. The evidence of experts and persons familiar with the conditions and the coal deposits in the community left no doubt but that there might be coal under the land, but no one had any reasonable ground for so saying. The witnesses for the taxing officers based their conclusions on the inference that because coal was found in adjoining land it must exist beneath the surface of the land in question. The experts who professed to be familiar with the character of the coal deposits throughout the community were of the opinion that such an inference was unwarranted. Under such circumstances and proof the existence of coal under the particular land was purely a matter of conjecture and the assessment in such case should not exceed the nominal sum of $1 per acre.

Colby, In re, —— Iowa ——, 169 Northwestern 443, p. 444.

INCOME FROM OIL PRODUCTION.

The Oklahoma statute of 1915 (Ch. 164, sec. 1) makes every person in the State liable for an annual tax on the entire net income arising and accruing from all sources. It also provides that a like tax shall be levied and paid upon the entire net income from all property owned, and of every business, trade, or profession carried on in the State by persons residing elsewhere. This statute is not invalid as to the income of a nonresident arising solely from the production of oil wells and appliances within the State of Oklahoma and managed by the owner residing in another State.

Shaffer v. Howard, 250 Federal 873, p. 875.

TANK CARS OF FOREIGN CORPORATION.

Property can be assessed under the statute of Louisiana only in the taxing district within which it is situated, and the State board of appraisers could not assess in one parish tank cars of a tank line company distributed over the railroads throughout the State under a lease between the tank line company and the railroads, the cars of which are operated entirely by the lessees. If the tank cars were subject to assessment, the assessment must be made for each parish wherein cars happen to be situated or in each parish for its proportional part of the average whole within the State.

Union Tank Line Co. v. Day, 143 La. ——, 79 Southern 334, p. 335.

INDIAN LANDS—PURCHASE FROM PRIVATE OWNER.

Indian lands, theretofore taxable, purchased from their private owners, with oil royalties accruing to a full-blooded Creek Indian from her restricted allotment, are not exempt from State taxation by a clause in the deed making the lands inalienable without the consent of the Secretary of the Interior.

Jones v. Whitlow, —— Okla. ——, 175 Pacific 753.

INCREASE OF VALUATION—ORDER OF ONE MEMBER OF COUNTY BOARD—RECOVERY OF TAXES.

An order increasing the valuation of mining property made on a hearing before one member of the county board of equalization was not absolutely void, nor even void or erroneous in any sense that would authorize the owner of the mining property to recover back the amount of taxes paid in accordance with an assessment made under such order. The board of equalization may designate one of its members to hear a particular complaint or to hear or to receive certain evidence, but if the board had no such power and the taxpayer consented thereto he could not be heard to complain, although the State might not be bound thereby.

Empire Min. Co. v. Bowers, —— Ala. ——, 79 Southern 561, p. 563.

MEETINGS OF BOARD OF EQUALIZATION—VALIDITY OF VALUATION.

An order of a county board of equalization fixing the valuation of mining property was not void because done at a time not fixed by statute for a meeting of the board. The statute authorizing the valuation prescribed and specified times for the meetings of the board but provided for regular and called sessions. The statute also expressly provided that if the acts and judgments should be done or rendered at times not authorized they should not be void on that account.

Empire Min. Co. v. Bowers, —— Ala. ——, 79 Southern 561, p. 563.

TRESPASS.

ENTRY ON INCLOSURE OF ANOTHER.

An entry upon the inclosure of another is a trespass where it is made surreptitiously as well as where it is made by force. The rule applies to a trespass upon the inclosed lands of another for the wrongful purpose of exploring for oil and for mining and removing any oil that might be found.

Collier v. Bartlett, —— Okla. ——, 175 Pacific 247, p. 250.

QUARRY OPERATIONS.

DUTY TO FURNISH SAFE PLACE—KEEPING PLACE SAFE.

The obligation of an employer to provide reasonably safe places for his employees to work does not obligate him to keep the places where the employees work in a safe condition at every moment of the work so far as its safety depends upon the due performance of that work by them and their fellow servants.

Falla v. Pine Mt. Granite Co., —— Ga. ——, 97 Southeastern 114, p. 115.

HAZARDOUS BUSINESS—CARE REQUIRED—SAFE TOOLS.

A quarry operator is engaged in hazardous business, and it is his duty to exercise care commensurate to the danger to be reasonably anticipated and to furnish such tools as will, so far as is reasonably practical, protect his employees from danger.

De Nardo v. Stephens-Jackson Co., —— Pa. ——, 104 Atlantic 584, p. 585.

DANGERS FROM BLASTING—DUTY TO WARN.

The dangers from blasting in quarry operations is one frequently recurring and its occurrence can be foreseen by the person charged with the duty of watching it, and if the danger is not foreseen and proper warning given the quarry becomes an unsafe place for the workmen; but it may be made reasonably safe if proper warning is given. It clearly follows that on the person whose duty it was to take care that the place should be kept safe was cast the duty of giving timely warning and it is a part of the operator's duty to his employees that proper care should be exercised in giving warning of an expected blast.

United Verde Copper Co. v. Kuchn, 253 Federal 425, p. 427.
Belleville Stone Co. v. Mooney, 60 N. J. Law 328, 38 Atl. 835.
Hjelm v. Western Granite Contracting Co., 94 Minn. 169, 102 Northwestern 384.
Jacobson v. Hobart Iron Co., 103 Minn. 319, 114 Northwestern 951.

FIRING BLASTS—WARNING—FAILURE TO HEED.

In the operation of a quarry it was the custom of the operator to fire blasts about 10 minutes after the end of the work for the day, a warning being given by blowing a whistle five times when it was expected that employees within the danger zone would seek shelter. The failure of an employee to obey the whistle while a careless and perhaps negligent omission of duty was not such serious and wilful conduct as would amount to a defense under the Connecticut Workmen's Compensation Act, and especially where the employee stopped at a commissary maintained by the employer within the danger zone and kept open at quitting time and where the employer in fact invited the employees to stop on their way home.

Merlino v. Connecticut Quarries Co., —— Conn. ——, 104 Atlantic 396, p. 397.

BLASTING—IRREPARABLE INJURY—INJUNCTION.

Where the facts averred show that irreparable injury is being sustained by blasting operations and the continuous throwing of rock and other débris on the complainant's land and that such trespass is a continuous one for which the law furnishes no adequate relief, an injunction will be made perpetual.

Woodstock Operating Corp. v. Quinn, —— Ala. ——, 79 Southern 253, p. 254.

BLASTING—INJURY TO LAND—DISPUTED TITLE—INJUNCTION.

In an action to enjoin quarry operations on the ground of the continuous throwing of rock and other débris on the complainant's land, injunction can not be granted if the title to the land in question is in dispute and where the complainant has not taken steps to establish his title.

Woodstock Operating Corp. v. Quinn, —— Ala. ——, 79 Southern 253, p. 254.

FOREMAN'S DIRECTION TO CONTINUE WORK—PROMISE TO REPAIR.

A boy 16 years old was engaged to drive cars loaded with rock from the quarry to the crusher. At a certain point at the top of the grade he unhooked the singletree from the car, turned the horse to the side and permitted the car to run by gravity to its destination. The hook that held the singletree had become mashed, bent and battered and made it difficult to remove the singletree while the car was in motion. Prior to his injury the boy had called the foreman's attention to the condition of the hook and the foreman had directed him to go ahead and use it for a day or two and they would have a new one made. The boy believed he could rely on these statements and was legally justified in doing so, and did not assume the risk occasioned by the defective condition of the hook and by reason of which he was subsequently injured by the car running upon him while he was attempting to remove the singletree from the defective hook.

Gingerly v. Phelps Stone & Supply Co., —— Mo. App. ——, 206 Southwestern 400, p. 401.

USE OF IRON TAMPING BAR.

A quarry operator knowingly permitted the tamping of explosives to be done with iron bars and failed to supply any wooden rods or other implements for that purpose. Under such circumstances the quarry operator was liable for injuries caused by an explosion while the hole man was using a tamping bar in filling a drilled hole with explosives, where the evidence was sufficient to justify the inference that the explosion was caused by the use of the iron tamping bar.

De Nardo v. Stephens-Jackson Co., —— Pa. ——, 104 Atlantic 584, p.

ASSUMPTION OF RISK—SAFE PLACE.

An employee in a quarry assumes the ordinary risks of his employment and is bound to exercise skill and diligence to protect himself.

Falla v. Pine Mt. Granite Co., —— Ga. ——, 97 Southeastern 114, p. 115.

RISKS NOT ASSUMED BY EMPLOYEES.

An illiterate foreign laborer who had never been employed in any other mine or quarry than that of the particular operator and who had no knowledge of blasting except as done by the quarry operator and who had never been warned of the danger of tamping explosives with an iron bar and who might assume that the employer had taken proper precautions for his safety, can not as a matter of law be charged with the assumption of the risk of danger from the use of an iron tamping bar.

De Nardo v. Stephens-Jackson Co., —— Pa. ——, 104 Atlantic 584, p. 585.

FELLOW SERVANTS—WHO ARE.

Where two or more employees are engaged in the same service in quarry operations and are engaged in labor for the furtherance of the general purpose of the business in which they contract to serve and are subject to the general control and direction of a single employer, they are fellow servants, though they may be employed in different departments or duties and so far removed from each other as that one can in no degree control or influence the conduct of the other.

Falla v. Pine Mt. Granite Co., —— Ga. ——, 97 Southeastern 114.

FELLOW SERVANTS—STONE CUTTER AND ENGINEER.

A person employed by a stone company in the cutting or breaking of stone is a fellow servant with the engineer and fireman of a locomotive operated by the same company in connection with the stone industry and with the employees engaged in making blasts in the quarrying of stone. The quarry operator is not liable for injuries occasioned to one servant by the negligence of a fellow servant.

Falla v. Pine Mt. Granite Co., —— Ga. ——, 97 Southeastern 114.

NEGLIGENCE—PROOF OF INJURY—PHYSICAL FACTS.

The duty of a boy 16 years old was to drive a horse hauling cars of stone out of a quarry. When the car reached the top of the grade it was his duty to detach the horse and the car would then run by gravity to its destination. While attempting to detach the car from the horse by leaning over with his head and shoulders in front of a moving car, the work was unnecessarily prolonged by reason of the defective, bent and battered condition of the hook that held the singletree and that by reason of such delay the car rushed forward, striking him on the side of the face and inflicting the injuries complained of. The fact that the plaintiff testified that the car struck him on the right side of his face is immaterial, though an impossible physical fact under the circumstances of the case, but it could not defeat the action where the evidence showed that the lower jaw bone was broken, many of his teeth knocked out, his face cut and bruised and he sustained a severe shock and injury to his head, and especially where the complaint did not state that the car in fact struck him on the right side of the face, though he so testified.

Gingerly v. Phelps Stone & Supply Co., —— Mo. App. ——, 206 Southwestern 400, p. 401.

DAMAGES FOR INJURIES TO MINERS.

ELEMENTS OF DAMAGES.

MEASURE OF DAMAGES—INSTRUCTIONS.

In an action by a boy 16 years of age for damages for injuries sustained while working in a mine, an instruction by the court is not reversible error because it authorized the jury to consider "how far, if at all, the injuries now or will inconvenience" the complainant, where the court in the same instruction charged the jury as to "the extent of the diminishing and impairing of his earning powers after attaining his majority, if any."

Jackson Hill Coal & Coke Co. v. Van Hentenryck, —— Ind. App. ——, 120 Northeastern 664, p. 669.

ACTION BY MINOR—RECOVERY FOR LOSS OF WAGES.

In an action by a boy 16 years old for damages for injuries received while working in a mine the court properly instructed the jury that the plaintiff could not recover for any loss of wages or inability to labor during the period previous to his arriving at 21 years of age.

Jackson Hill Coal & Coke Co. v. Van Hentenryck, —— Ind. App. ——, 120 Northeastern 664, p. 669.

EXPENSES OF MEDICAL TREATMENT.

In estimating the amount of damages to an injured miner the jury may take into consideration various elements including his necessary expense for medical attention and treatment.

Honey v. St. Regis Min. & Smelting Co., —— Mo. ——, 205 Southwestern 93, p. 95.

EXPENSES OF TREATMENT—INSTRUCTION.

In an action by a boy 16 years old for damages for injuries sustained while working in a mine the court properly instructed the jury that the plaintiff was not entitled to recover for the expenses of a physician, nurse hire, or any expenses in treating his alleged injury.

Jackson Hill Coal & Coke Co. v. Van Hentenryck, —— Ind. App. ——, 120 Northeastern 664, p. 669.

PROOF OF INJURIES—EXPERT EVIDENCE—OPINION OF WITNESS.

Where the injuries complained of are of such a character as to require skillful and professional men to determine the cause and extent of the injury, the question is exclusively within the domain of science and must be determined by men skillful in the science of medicine; but this rule does not apply where the evidence relates to the effect of the injury complained of and the physical ability of the injured person to perform labor. In such case a nonexpert witness after stating the facts upon which the opinion is based may give an opinion as to the effect of the injury and the ability of the injured person to perform labor.

Creek Coal Min. Co. v. Paprotta, —— Okla. ——, 175 Pacific 235, p. 236.

ABILITY TO PERFORM LABOR—OPINION OF WITNESS.

The ability of an injured person to perform manual labor is not a matter so exclusively within the domain of medical science that witnesses who were acquainted with the injured person and had opportunity to observe his ability can not testify in reference thereto.

Creek Coal Min. Co. v. Paprotta, —— Okla. ——, 175 Pacific 235, p. 236.

WAGES PAID AFTER INJURY—CREDIT.

After an accident to a coal miner the coal mine operator continued to pay him wages amounting to a large sum before the miner commenced his action for damages. On the trial of the case the court instructed the jury that if it found in favor of the plaintiff for a sum in excess of the amount of the payments made then credit should be given on the verdict for the sum so paid.

James v. Winnifred Coal Co., —— Iowa ——, 169 Northwestern 120, p. 125.

OCCUPATIONAL DISEASE.

An "occupational disease" suffered by a miner as distinguished from a disease caused or superinduced by natural wrong or injury is a disease which is a usual incident or result of the particular employment in which the miner was engaged as distinguished from a disease which is caused or brought about by the employer's failure in his duty to furnish him a safe place to work. A wrongful injury which operates to destroy or undermine or impair the health of a miner is no less actionable than is a wrong from which the miner sustains wounds or bruises or broken bones.

Gay v. Hocking Coal Co., —— Iowa ——, 169 Northwestern 360, p. 362.

RELEASE OF DAMAGES—SUBSEQUENT COMPLICATIONS.

A release of damages by an injured miner on payment of a comparatively small sum can not be extended to cover the loss of a leg and other severe injuries not connected with the particular injury contemplated by both parties at the time the release was executed and for injuries that developed after the release was executed. It can not be assumed that a healthy man in the prime of life, dependent upon a calling which requires unusual physical strength, intended to accept $200 as full compensation for the permanently helpless condition which subsequently arose.

Gold Hunter Min. & Smelting Co. v. Bowden, 252 Federal 388, p. 391.

SETTLEMENT AND RELEASE—FRAUD IN OBTAINING.

Where a miner had been injured and while in a hospital confined in his bed suffering from the injury and under the effects of chloroform, the assistant superintendent of the mine operator visited him for the purpose of obtaining a release of damages for the injuries. The assistant superintendent looked after insurance for the miners and had adjusted insurance for the injured miner before and informed the injured miner that he had come to see about his insurance. The injured miner believed that the business related solely to the insurance and when he signed the instrument, the pretended release, he thought he was signing an instrument to get his insurance. The evident purpose of the assistant superintendent was to obtain an advantage to which the mine operator was not entitled, and a release of damages under such circumstances is fraudulent and can not operate to defeat an action by the injured miner for damages.

Dovich v. Chief Consolidated Min. Co., —— Utah ——, 174 Pacific 627, p. 631.

SETTLEMENT OF DAMAGES—FRAUD IN OBTAINING RELEASE.

Settlements of damage cases between employers and employees are to be encouraged, but disingenuousness and unfairness on the part of either are reprehensible. Settlements procured by fraud and by false representations as to the objects of the settlement would not be binding upon an injured employee.

Dovich v. Chief Consolidated Min. Co., —— Utah ——, 174 Pacific 627, p. 631.

RELEASE OBTAINED BY FRAUD—PROOF—INSTRUCTION.

In an action by a miner for damages for injuries a release of all damages was pleaded as a defense. The plaintiff alleged that the release was procured by fraud. The court instructed the jury to the effect that before they could disregard the release on the ground of fraud it must appear by evidence that is clear, cogent, and convincing that fraud was practiced upon the plaintiff and he was thereby led into the execution of the instrument. On appeal the court says of this instruction: "The words 'clear, cogent, and convincing' denote something more than a mere preponderance. If such words were used in an ordinary civil case and excepted to by the losing party, we believe the exception would be well taken for the reason that they do imply something more than a mere preponderance, and a preponderance is all that is ordinarily required. We are not conceding that more than a preponderance was required in the present case. For the reasons above stated this assignment should not prevail."

Dovich v. Chief Consolidated Min. Co., —— Utah ——, 174 Pacific 627, p. 631.

DAMAGES NOT EXCESSIVE.

INSTANCES.

An award of $1,000 will not warrant the reversal of a judgment as excessive in an action by a boy 16 years of age injured in a mine where it was shown that his leg was broken, his spinal column wrenched and strained, and that in healing the bones of his leg were so united that his leg was bent or bulged forward.

Jackson Hill Coal & Coke Co. v. Van Hentenryck, —— Ind. App. ——, 120 Northeastern 664, p. 669.

A boy 16 years old driving a rock car in a stone quarry was injured by having some of his teeth knocked out, his lower jaw broken so that it had to be wired up in such a way that he could only get sustenance for many weeks by drawing it through his teeth; his face was cut, bruised, and contused, and he sustained a severe shock and injury to his head and suffered severely in other parts of his body. There was a nervous jerking of the leg and arm and a lack of perfect approximation of the teeth which could never be rectified. A verdict of $4,500 for these injuries was not excessive.

Gingerly v. Phelps Stone & Supply Co., —— Mo. App. ——, 206 Southwestern 400, p. 402.

A verdict for $25,000 was approved where the evidence showed that a miner was struck with a quantity of rocks and stones from a blast that resulted in the loss of both eyes, the total loss of the hearing in one ear, an impairment of the other, some destruction of the molar bones of the jaw, and a wound in one shoulder.

United Verde Copper Co. v. Kuchn, 253 Federal 425, p. 427.

DAMAGES EXCESSIVE.

INSTANCES.

An assessment of $15,000 damages for the loss of one leg, amputated some 6 inches above the ankle, and also the loss of the little finger on the right hand, was held to be excessive. A remitter of $5,000 was ordered on condition that the judgment be affirmed for $10,000.

Johnson v. Waverly Brick & Coal Co., —— Mo. ——, 205 Southwestern 615, p. 618.

INTERSTATE COMMERCE.

WORKMEN'S COMPENSATION ACT—APPLICATION TO EMPLOYEES.

The fact that a natural gas company was engaged in interstate commerce in transporting natural gas from West Virginia into Ohio does not prevent the application of the workmen's compensation act of West Virginia to an employee injured while assisting in the location of a derrick at one of the company's wells, where such injured person and those working with him were engaged in work wholly within the State of West Virginia and which work was only incidental to the actual transportation of the gas.

Suttle v. Hope Nat. Gas Co., —— W. Va. ——, 97 Southeastern 429, p. 433.

COMPENSATION ACT—POWER OF STATE—COMPENSATION.

With respect to the employees of an employer engaged in interstate commerce a State has full and exclusive power to prescribe a method of compensation for all employees whose work is wholly intrastate and clearly separable and distinguishable from work in interstate commerce. A State also has permissive power to prescribe a method of compensation within the field belonging primarily to Congress until the latter has exercised its superior power covering the same subject.

Suttle v. Hope Nat. Gas Co., —— W. Va. ——, 97 Southeastern 429, p. 431.

NATURAL GAS—TRANSPORTATION BETWEEN STATES.

Natural gas is a commodity as much so as coal and when transported through conduits to market becomes the subject of interstate or intrastate commerce accordingly as the transportation between the place of production and distribution and sale is in different States or in the same State.

Suttle v. Hope Nat. Gas Co., —— W. Va. ——, 97 Southeastern 429, p. 431.

STORAGE OF EXPLOSIVES—POWER OF CITY.

The statute of the United States (Rev. Stat., secs. 4278, 4279) regulates the transportation of explosives as to foreign and interstate commerce; but the statute does not prohibit a city from designating places in a harbor where explosives in the course of transportation in foreign or interstate commerce shall be deposited or kept.

City of Seattle v. Lloyd's Plate Glass Ins. Co., 253 Federal 321, p. 323.

EXPLOSIVES.

CARE REQUIRED FOR SAFETY.

In the employment of inherently dangerous agencies such as powder or other explosives it is the duty of the employer to exercise a degree of care for the safety of his employees commensurate with the danger reasonably to be anticipated.

De Nardo v. Stephens-Jackson Co., —— Pa. ——, 104 Atlantic 584, p. 585.

DANGER—UNSAFE PLACE—WARNING.

A mine operator using a highly dangerous explosive in his mine thereby renders the place unsafe, unless proper rules are made for the handling of the explosive and proper warning is given of an intended blast.

United Verde Copper Co. v. Kuchn, 253 Federal 425, p. 426.
See Hendrickson v. United States Gypsum Co., 133 Iowa 89, 110 Northwestern 322.

MINE OPERATOR'S DUTY TO WARN—DELEGATION OF DUTY.

In the use of explosives in a jurisdiction where the fellow servant rule has been abolished by statute, the law imposes upon an employer or a mine operator, under the safe place rule, a responsibility he can not delegate to others and determines his liability for the negligence of a fellow servant.

United Verde Copper Co. v. Kuchn, 253 Federal 425, p. 427.

NEGLIGENCE—LIABILITY.

The owner of a foundry kept a tank of naphtha in the street of a city. The fact that the naphtha was kept in the street and had no sign painted thereon, as required by the city ordinance, will not of itself prevent a recovery by the plaintiff against a railroad company for negligently backing a car against the naphtha tank, causing an explosion and the destruction of the owner's property and the injury complained of.

Kupferle Foundry Co. v. St. Louis Merchant Bridge, etc., R. Co., —— Mo. ——. 205 Southwestern 57, p. 58.

ACCESSIBILITY TO CHILDREN—NEGLIGENCE.

A mining company stored its explosives and dynamite caps in an open box kept at the side of a building and in plain view from a path over which the public, including children, passed, without notice or warning of any kind and with knowledge that large numbers of children and adults passed over the path and near the box of dynamite caps. Under such circumstances the mining company was held liable for injuries to a child 8 years old caused by the explosion of a dynamite cap taken from the box.

Anderson v. Newport Min. Co., —— Mich. ——, 168 Northwestern 523, p. 524.

EXPOSED DYNAMITE CAPS—INJURY TO BOY.

A city while digging a sewer made excavations by the use of explosives, using dynamite and dynamite caps for this purpose. At the end of a day's work the foreman placed an unlocked box of dynamite caps on adjoining premises. A boy 9 years old, son of the owner of the premises, was attracted by the box of caps, took two of the caps, and in attempting to solder them together caused them to explode, lacerating one hand so that amputation was necessary, and receiving injuries to his eye, face, and other parts of his body. The father, as the owner of the premises, did not know that the employees of the city had placed the box of caps on his premises. Under these circumstances the act of the foreman in leaving the box of dynamite caps on the premises accessible to the boy was the proximate cause of the injury, for which the city was liable in damages.

City of Lubbock v. Bagwell, —— Tex. Civ. App. ——, 206 Southwestern 371, p. 372.

POWER OF CITY TO REGULATE.

A city has no power or authority absolutely to prohibit the use of such products in the city; but a city possesses power merely to regulate the use, sale, and disposition of explosives. A city ordinance attempting to regulate the storage of explosives will not be enforced and will be held invalid as unreasonable where its enforcement would absolutely prohibit the use or storage of any such explosives as gasolines, benzines and napthas.

Standard Oil Co. v. City of Birmingham, —— Ala. ——, 79 Southern 489, p. 492.

VALIDITY OF CITY ORDINANCE REQUIRING INSPECTION.

A city ordinance provided that gasolines, benzines, and napthas kept for sale should be tested by inspectors and that they "shall have a specific gravity at 60 degrees Fahrenheit of not less than 58 nor more than 84." The ordinance as enacted and published is void for uncertainty because unreasonable and incapable of performance, as it requires the oils or the products mentioned to be more than twice as heavy as the heaviest substance known to science; and under such an ordinance a city can not collect and enforce its fees for inspection.

Standard Oil Co. v. City of Birmingham, —— Ala. ——, 79 Southern 489, p. 490.

TRANSPORTATION—REGULATION BY CITY.

The United States Revised Statutes, sections 4278 and 4279, regulating the transportation of nitroglycerin and other explosives in respect to foreign or interstate commerce, expressly declares that these sections shall not be construed to prevent any State or city from regulating or from prohibiting the traffic or transportation of nitroglycerin or the explosives named. These sections do not deprive a city of the right to designate places in a harbor where such explosives may be stored or kept if it is not a burden to either foreign or interstate commerce.

City of Seattle v. Lloyd's Plate Glass Ins. Co., 253 Federal 321, p. 323.

NAPTHA TANK IN STREET—LIABILITY FOR EXPLOSION.

The operator of a foundry kept a naptha tank in a street within a few feet of his property. A railroad company having a spur track in the street negligently ran a car off the end of the track and against the naptha tank, causing an explosion and the destruction of the owner's property. The fact that the railway employees did not know that the tank contained naptha, an explosive, will not protect the railroad company from liability for damages caused by the explosion resulting from its negligence.

Kupferle Foundry Co. v. St. Louis Merchant Bridge, etc., R. Co., —— Mo. ——, 205 Southwestern 57, p. 58.

PUBLICATIONS RELATING TO MINING LAWS.

A limited supply of the following publications of the Bureau of Mines has been printed and is available for free distribution until the edition is exhausted. Requests for all publications can not be granted, and to insure equitable distribution applicants are requested to limit their selection to publications that may be of especial interest to them. Requests for publications should be addressed to the Director, Bureau of Mines.

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PUBLICATIONS AVAILABLE FOR FREE DISTRIBUTION.

BULLETIN 75. Rules and regulations for metal miners, by W. R. Ingalls and others. 1915. 296 pp., 1 fig.

BULLETIN 90. Abstracts of current decisions on mines and mining, December, 1913, to September, 1914, by J. W. Thompson. 1916. 176 pp.

BULLETIN 101. Abstracts of current decisions on mines and mining, October, 1914, to April, 1915, by J. W. Thompson. 1915. 138 pp.

BULLETIN 118. Abstracts of current decisions on mines and mining, reported from October to December, 1915, by J. W. Thompson. 1916. 74 pp.

BULLETIN 126. Abstracts of current decisions on mines and mining, reported from January to April, 1916, by J. W. Thompson. 1916. 90 pp.

BULLETIN 164. Abstracts of current decisions on mines, reported from September to December, 1917, by J. W. Thompson. 1918. 147 pp.

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BULLETIN 174. Abstracts of current decisions on mines and mining reported from May to September, 1918. 139 pp.

PUBLICATIONS THAT MAY BE OBTAINED ONLY THROUGH THE SUPERINTENDENT OF DOCUMENTS.

BULLETIN 61. Abstracts of current decisions on mines and mining, October, 1912, to March, 1913, by J. W. Thompson. 1913. 82 pp. 10 cents.

BULLETIN 65. Oil and gas wells through workable coal beds, papers and discussions, by G. S. Rice, O. P. Hood, and others. 1913. 101 pp., 1 pl., 11 figs. 10 cents.

BULLETIN 79. Abstracts of current decisions on mines and mining, March to December, 1913, by J. W. Thompson. 1914. 140 pp. 20 cents.

BULLETIN 94. United States mining statutes, annotated, by J. W. Thompson. 1915. 1772 pp. In two parts, not sold separately. Cloth, $2.50 per set; paper, $2.00.

BULLETIN 113. Abstracts of current decisions on mines and mining, reported from May to September, 1915, by J. W. Thompson. 1916. 124 pp. 15 cents.

BULLETIN 143. Abstracts of current decisions on mines and mining, reported from May to August, 1916, by J. W. Thompson. 1916. 72 pp. 10 cents.

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BULLETIN 152. Abstracts of current decisions on mines and mining, reported from January to April, 1917, by J. W. Thompson. 1917. 79 pp. 10 cents.

BULLETIN 159. Abstracts of current decisions on mines and mining, reported from May to August, 1917, by J. W. Thompson. 1917. 111 pp. 10 cents.

TECHNICAL PAPER 53. Proposed regulations for the drilling of oil and gas wells, with comments thereon, by O. P. Hood and A. G. Heggem. 1913. 28 pp., 2 figs. 5 cents.

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DEPARTMENT OF THE INTERIOR
JOHN BARTON PAYNE, Secretary
BUREAU OF MINES
FREDERICK G. COTTRELL, Director

BIBLIOGRAPHY OF PETROLEUM AND ALLIED SUBSTANCES
1917

BY

E. H. BURROUGHS

WASHINGTON
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1920

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BIBLIOGRAPHY OF PETROLEUM AND ALLIED SUBSTANCES, 1917.

By E. H. BURROUGHS.

INTRODUCTION.

This bulletin is the third of the series of yearly petroleum bibliographies being published by the Bureau of Mines. The two preceding, Bulletin 149 and Bulletin 165, were for the years 1915 and 1916, respectively. In arranging the references the same general scheme has been followed, but as in those bulletins, several changes and additions have been made in the classification, the more important being in the classes "Development and production" and "Refining and refineries." German periodicals for 1917 were not procurable and references to articles in those and in other foreign journals that were not available have been credited to the sources from which they were procured.

ACKNOWLEDGMENT.

Acknowledgment is made to C. P. Bowie, M. J. Gavin, C. H. Beal, E. W. Wagy, and F. B. Tough of the petroleum division of the bureau for assistance in arranging the references, and to Miss F. A. Armstrong for the index.

PUBLICATIONS EXAMINED.

SERIALS.

The following list contains the names of the serials examined in preparing this bibliography and the abbreviations used in the text references:

American Chemical Society, journal	Jour. Am. Chem. Soc.
American Gas Engineering Journal (formerly American Gas Light Journal)	Am. Gas. Eng. Jour.
American Institute of Mining Engineers, bulletin	Bull. Am. Inst. Min. Eng.
American Institute of Mining Engineers, transactions	Trans. Am. Inst. Min. Eng.
American Journal of Science	Am. Jour. Sci.
American Leather Chemists Association, journal	Jour. Am. Leather Chemists Assoc.

American Mining Congress, proceedings	Proc. Am. Min. Congress.
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American Society of Mechanical Engineers, journal	Jour. Am. Soc. Mech. Eng.
American Society of Naval Engineers, journal	Jour. Am. Soc. Naval Eng.
American Society for Testing Materials, proceedings	Proc. Am. Soc. Test. Materials.
Automobile (changed to Automotive Industries, November, 1917)	Automobile.
Automotive Industries. (See Automobile.)	Autom. Ind.
Boletin del Petróleo	Bol. del Petróleo.
California Academy of Sciences, proceedings	Proc. California Acad. Sci.
Canadian Engineer	Canadian Engineer.
Canadian Mining Institute, bulletin	Bull. Canadian Min. Inst.
Canadian Mining Institute, transactions	Trans. Canadian Min. Inst.
Canadian Mining Journal	Canadian Min. Jour.
Chemical Abstracts	Chem. Abs.
Chemical News	Chem. News.
Chemical Society, journal	Jour. Chem. Soc.
Cleveland Engineering Society, journal	Jour. Cleveland Eng. Soc.
Cornell Civil Engineer	Cornell Civ. Eng.
Economic Geology	Econ. Geol.
Engineer	Engineer.
Engineering	Engineering.
Engineering and Contracting	Eng. and Contr.
Engineering and Mining Journal	Eng. and Min. Jour.
Engineering News-Record (consolidation of Engineering News and Engineering Record)	Eng. News-Rec.
Engineers' Society of Western Pennsylvania, proceedings	Proc. Eng. Soc. Western Pennsylvania.
Franklin Institute, journal	Jour. Franklin Inst.
Gas Age	Gas Age.
Gas Engine	Gas Engine.
Gas World	Gas World.
Génie Civil	Génie Civil.
Geological Magazine	Geol. Mag.
Geological Society of America, bulletin	Bull. Geol. Soc. Am.
Good Roads	Good Roads.
Horseless Age	Horseless Age.
Industrial Management (formerly Engineering Magazine)	Ind. Management.
Institution of Mining Engineers, transactions	Trans. Inst. Min. Eng.
Institution of Petroleum Technologists, journal	Jour. Inst. Petroleum Tech.
International Marine Engineering	Int. Marine Eng.
Journal of Electricity (formerly Journal of Electricity, Power, and Gas)	Jour. Elec.
Journal of Geology	Jour. Geol.
Journal of Industrial and Engineering Chemistry	Jour. Ind. and Eng. Chem.
Manufacturers Record	Manufac. Rec.
Metallurgical and Chemical Engineering	Met. and Chem. Eng.
Mining and Oil Bulletin	Min. and Oil Bull.
Mining and Scientific Press	Min. and Sci. Press.
Municipal Journal	Munc. Jour.
National Academy of Sciences, proceedings	Proc. Nat. Acad. Sci.

National Fire Protection Association, quarterly	Nat. Fire Protect. Assoc. Quart.
National Petroleum News	Nat. Petroleum News.
Natural Gas and Gasoline Journal	Nat. Gas and Gasoline Jour.
La Nature	La Nature.
Oil Age	Oil Age.
Oil and Gas Journal	Oil and Gas Jour.
Oil, Paint, and Drug Reporter	Oil, Paint, and Drug Rep.
Oil Trade Journal	Oil Trade Jour.
Oildom	Oildom.
Petroleum	Petroleum.
Petroleum Age	Petroleum Age.
Petroleum Review	Petroleum Rev.
Petroleum World	Petroleum World.
Power	Power.
Power Plant Engineering (formerly Practical Engineer)	Power Plant Eng.
Practical Engineer (Changed to Power Plant Engineering, September, 1917)	Prac. Eng.
Railway Age Gazette	Rwy. Age Gaz.
Railway Review	Rwy. Rev.
Resources of Tennessee	Resources of Tennessee.
Revue générale des sciences pures et appliquées	Rev. gén. Sci.
Royal Society of Arts, journal	Jour. Roy. Soc. Arts.
S. A. E. Bulletin (changed to Journal of the Society of Automotive Engineers, July, 1917)	S. A. E. Bull.
Scientific American	Sci. Am.
Scientific American Supplement	Sci. Am. Suppl.
Society of Automotive Engineers, journal	Jour. Soc. Auto. Eng.
Society of Chemical Industry, journal	Jour. Soc. Chem. Ind.
Society of Engineers (London), transactions	Trans. Soc. Eng.
Standard Oil Bulletin	Standard Oil Bull.
Texaco Star	Texaco Star.
University of California, Department of Geology, bulletin	Bull. Univ. California Dept. Geol.
Washington Academy of Sciences, journal	Jour. Wash. Acad. Sci.
Western Engineering	West. Eng.
Western Society of Engineers, journal	Jour. Western Soc. Eng.
Worcester Polytechnic Institute, journal	Jour. Worcester Polytech. Inst.

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Bureau of Standards, circulars and technologic papers.

Corps of Engineers, professional memoirs.

Geological Survey, bulletins, professional papers, geologic folios, Mineral Resources of the United States for 1915.

Department of Agriculture, bulletins.

Department of Commerce, Daily Commerce Reports.

Such reports of State geological surveys and mining bureaus and foreign geological surveys and mining bureaus as were published in 1917.

SCHEME OF CLASSIFICATION.

The scheme of classification followed in arranging the references is outlined below.

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GEOLOGY AND ORIGIN.

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See also Nos. 391, 1480.

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[a] Figures in parentheses refer to classification numbers; see pages 6–14.

DEVELOPMENT AND PRODUCTION.

See No. 473.

TRANSPORTATION.

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PROPERTIES AND THEIR DETERMINATION.

9. **Odom, W. F., and Davies, W. W.** Comparison of medicinal mineral oils—Russian and American. Jour. Am. Pharm. Assoc., vol. 6, March, 1917, pp. 257–259. Shows that Russian oil, for chemical, clinical, and physical reasons, is better than the American oil now on the market.

See also Nos. 4, 742.

REFINING AND REFINERIES.

10. **James, H. G.** Refining industry of United States. Oil and Gas Jour., vol. 16, Oct. 18, 1917, pp. 40–42; Oct. 25, pp. 34–36; Nov. 1, pp. 38–39, 46; Nov. 8, pp. 38–39, 46; Nov. 15, pp. 32, 39; Nov. 22, pp. 34, 36; Nov. 29, pp. 35–36, 39; Dec. 6, pp. 38, 40; Dec. 13, pp. 30, 32, 34; Dec. 20, pp. 40, 46; Dec. 27, pp. 36, 38–39. General survey of conditions among refineries of the country, with brief explanations of the most important processes now in use, and of recent progress made toward their perfection. Chiefly statistical.

See also Nos. 33, 34, 35, 36, 37.

UTILIZATION.

11. **Roosevelt, F. D.** The national need of naval petroleum reserves. Proc. Am. Min. Congress, vol. 19, 1916 (published 1917), pp. 393–396. Enumerates the advantages of oil-burning vessels in the U. S. Navy, and considers the necessity of a reserve supply of oil in tankage away from the coast in the event of war; of a current supply in tankage at fueling ports; and of a natural underground protected reserve to insure supply for the future of oil-burning ships.

12. **Secretary of the Navy.** Annual report for the fiscal year 1916. Washington, 1917. 78 pp. Discusses (pp. 31–36) the necessity for oil conservation in the United States, the present status of the naval petroleum reserves, and the advantages of oil-burning vessels over those using coal.

13. ——— Annual report for the fiscal year. (Including operations and recommendations to Dec. 1, 1917.) Washington, 1917. 106 pp. Includes a brief discussion (p. 59) of the protection of the oil reserves of the country for use of the Navy.

STATISTICS.

GENERAL REVIEW.

14. **Day, D. T.** Petroleum and natural gas. Mineral Industry during 1916 (New York, 1917), pp. 532–567. Statistical review.
15. **Richardson, Clifford.** Asphalt. Mineral Industry during 1916 (New York, 1917), pp. 69–76. Statistical review.

FIELD DEVELOPMENT, NATURAL GAS.

16. **Natural Gas and Gasoline Journal.** Location and description of new wells drilled in Kentucky, Tennessee, Ohio, Pennsylvania, West Virginia, Illinois, Indiana, Kansas, Louisiana, Oklahoma, and Texas. Also gives summary for all fields by districts.

FIELD DEVELOPMENT, OIL AND GAS.

17. **Oil and Gas Journal.** Monthly statement gives location and initial production of completed wells, location of drilling wells, and summary for each field, by districts, with comparisons for preceding months.
18. **United States Geological Survey.** Mineral Resources of the United States, part 2, Nonmetals. Yearly report of development by States.

IMPORTS AND EXPORTS OF ASPHALT.

IMPORTS AND EXPORTS OF PETROLEUM.

See No. 15.

19. **United States Bureau of Foreign and Domestic Commerce.** Monthly summary of foreign commerce of the United States.

NEW INCORPORATIONS.

20. **Natural Gas and Gasoline Journal.** Monthly statement lists new companies, chiefly natural gas companies, in the United States. January–December, 1917.
21. **Oil Trade Journal.** Monthly statement of new charters granted to oil companies in all States. January–December, 1917.
22. **Petroleum.** Monthly list of recent incorporations of petroleum producing, refining, and jobbing concerns, and gas companies in all States. January–December, 1917.

PIPE LINE STATISTICS.

23. **Oil and Gas Journal.** Monthly report gives runs, deliveries, and stocks in Kansas-Oklahoma field, Texas panhandle, Caddo district, Louisiana, California, Pennsylvania, and Illinois. January–December, 1917.
24. **Petroleum Age.** Comparative pipe-line statistics for the United States. Monthly statement of runs, deliveries, gross stocks, and summary by fields. January–December, 1917.
25. **United States Geological Survey.** Mineral Resources of the United States, part 2, Nonmetals. Annual statistics.

PRICES.

26. **National Petroleum News.** Weekly statement of prices of crude petroleum in all fields. January–December, 1917.

27. **Oil Age.** Monthly report of prices of crude oil in all fields, and of refined products of petroleum in Los Angeles. January–December, 1917.

28. **Oil and Gas Journal.** Weekly report of prices throughout the United States. January–December, 1917.

29. **Oil Trade Journal.** Monthly statement of crude and fuel oil prices. January–December, 1917.

30. **Petroleum.** Monthly report of prices in all fields. January–December, 1917.

31. **United States Geological Survey.** Mineral Resources of the United States, part 2, Nonmetals. Annual report gives fluctuations in price for each field throughout the year.

PRODUCTION.

32. **United States Geological Survey.** Mineral Resources of the United States, part 2, Nonmetals. Annual report of output and value of petroleum, natural gas, natural-gas gasoline, and asphalt, by States.

REFINING AND REFINERIES.

33. **Bureau of the Census.** Abstract of the census of manufactures, 1914. Washington, 1917. 721 pp. Includes statistics of the petroleum refining industry.

34. ——— Census of Manufactures: 1914. Petroleum, refining. Washington, 1917. 13 pp. Gives summary and analysis, with general data compiled for the industry; special tables relating to materials, products, and methods of manufacture; and State comparisons for 1904, 1909, and 1914, and detailed statistics by States for 1914.

35. **Egloff, Gustav.** Output of gasoline due to cracking. Oil and Gas Jour., vol. 16, Dec. 20, 1917, p. 42. From figures of refinery products by the Bureau of Mines (See No. 37), calculates percentages of straight-run and cracked gasoline for 1916 and half of 1917, on the basis of the total crude refined and on the basis of the total gasoline marketed.

36. **National Petroleum News.** Gasoline yield for 1917 is 20 per cent of crude. Vol. 9, November, 1917, p. 15. Gives refinery operations for the first six months of 1917, by months and by fields, and adds a table of percentages of products produced to crude oil run in the first six months of 1917.

37. **Oil and Gas Journal.** Figures covering supply of gasoline. Vol. 16, Nov. 8, 1917, p. 34. Quotes Bureau of Mines figures, gives refinery operations for the first six months of 1917, by months and by fields, and for the whole of 1916, by fields.

See also Nos. 10, 47.

TANKAGE.

38–39. **Petroleum Age.** Monthly statement gives summary of oil in tankage, by fields. January–December, 1917.

LEGAL REGULATIONS.

40–41. **United States Congress, House, Committee on Public Lands.** Exploration for and disposition of coal, oil, gas, etc. Report to accompany H. R. 3232. Washington, 1917. 11 pp. 65th Cong., 2d sess. House Rept. No. 206. Submitted by Mr. Ferris.

42. UNITED STATES CONGRESS, SPECIAL JOINT COMMITTEE ON GENERAL LEASING BILL. General leasing bill. Proceedings of the special joint conference of the Committees on Public Lands, United States Congress, and representatives of the Departments of Justice, Navy, and Interior, Sixty-fourth Congress, 2d sess., on H. R. 406, an act to authorize exploration for and disposition of coal, phosphate, oil, gas, potassium, or sodium. Printed for the use of the Senate Committee on Public Lands. Washington. 1917. 144 pp.

See also Nos. 190, 1459–1464.

ECONOMICS.

43. ARNOLD, RALPH. General condition of the petroleum industry and the world's future supply. Bull. Geol. Soc. Am., vol. 28, Sept., 1917, pp. 603–616. Outlines present conditions in the oil industry and the problems confronting it, particularly that of future supply. Discusses future sources of oil by countries, in geographic order, beginning with North America.

44. ——— The world's oil supply. Proc. Am. Min. Congress, vol. 19, 1916 (published 1917), pp. 473–490. Outlines the status and possibilities of the oil industry in the most important producing countries of the world (Canada, United States, Mexico, Central America, West Indies, Colombia, Ecuador, Peru, Bolivia, Argentina, Great Britain, France, Germany, Italy, Austria, Roumania, Russia, Turkey, Persia, Arabia, India, China, Dutch East Indies, Philippine Islands, Japan, Africa), and shows that the supply is restricted and should be carefully conserved.

45. BEDFORD, A. C. Oil in the war. Oildom, vol. 7, October, 1917, pp. 483–484, 486, 488. Address, "Priority and distribution," under the general heading, "How American industry can help win this war," at convention of business men, September, 1917. Reviews the situation as to supply and demand of American petroleum and its products, and suggests policies which should insure a sufficient supply for the needs of the war.

46. CLAPP, F. G. Remedies for the petroleum and gasoline situation. Eng. and Min. Jour., vol. 104, Aug. 4, 1917, pp. 196–201. Discusses the present shortage and various remedies, such as the use of substitutes, of foreign oils and of shale oils, and the discovery and development of new fields, the last two affording the only permanent remedy. Suggests that new development be under the supervision of an efficient organization of geologists.

47. FEDERAL TRADE COMMISSION. Report on the price of gasoline in 1915. Washington. 1917. 224 pp. Considers in detail the various factors of the rise in price, such as demand and supply, costs and margins, earnings and dividends, inequalities in competition and price, retail prices and margins, and the position of the Standard companies in the industry. Recommendations are made for common ownership, pipe-line control, publicity of statistics, and quality of product. Numerous curves and statistical tables are given.

47a. NORTHRUP, J. D. Petroleum. U. S. Geol. Survey Bull. 666–DD, 1917. 18 pp. Advance chapter of Bulletin 666, "Our Mineral Supplies," which discusses the important minerals of the United States as to supply, uses in peace and in war, normal demand and probable demand in war. This chapter takes up the petroleum industry, domestic sources of petroleum, and the influence of the war on the industry.

48. WILLIAMS, W. A. Present and future in oil. Oildom, vol. 7, October, 1917, pp. 494, 496. Discusses present and future demands on the petroleum industry, and possible remedies for shortage of crude oil and its products.

APPALACHIAN FIELD.

HISTORICAL REFERENCES AND GEOGRAPHIC OCCURRENCE.

49. Ashley, G. H. Oil resources of black shales of the eastern United States. U. S. Geol. Survey Bull. 641, 1917, pp. 311–324. Published also as separate Bull. 641–L, 1917. Abstract in Jour. Wash. Acad. Sci., vol. 7, Nov. 4, 1917, pp. 564–565. Results of an investigation of shales in several eastern States to determine their content of oil and consequent commercial possibilities. Gives occurrence of the shale in these States, describes samples taken, and gives table of distillation test of the samples.

GEOLOGY AND ORIGIN.

50. Fuller, M. L. Appalachian oil field. Bull. Geol. Soc. Am., vol. 28, September, 1917, pp. 617–654. Gives historical summary of the oil industry in the Appalachian field by States; describes the geology of each State of the field; discusses the origin of the oil in the field, and the relations of Appalachian oil to structure; gives production statistics and discusses the future of the field and the influence of various important factors on its future development.

51. Johnson, R. H., and Huntley, L. G. Nature's wonderfully prolific reservoirs. Oil City Derrick Supplement, Dec. 15, 1917, pp. 3, 5. How practical geology resulted in the development of oil in the eastern United States. Principal fields briefly described.

See also No. 50.

DEVELOPMENT AND PRODUCTION.

52. Mills, R. V. A., and Wells, R. C. The evaporation of water at depth by natural gases. Jour. Wash. Acad. Sci., vol. 7, May 19, 1917. pp. 309–310. (Abstract.) A study of the changes in Appalachian oil-field waters during the production of petroleum and natural gas, with conclusions upon the origin of oil-field brines and salt domes.

53. Reeves, Frank. The absence of water in certain sandstones of the Appalachian oil fields. Econ. Geol., vol. 12, June, 1917, pp. 354–378. Discussion, October–November, pp. 610–628, by E. W. Shaw. Summary: "There seems to be good evidence that the nonwater-bearing sandstones of the Catskill formation in southwestern Pennsylvania and West Virginia were dried out by the semiarid condition which existed during Catskill time, which also brought about the formation of continental 'red beds.' In addition to this conclusion and partly resulting from it, the statement can be made that the facts observed do not substantiate the idea held by some geologists that there is a disappearance of water with depth. It is quite likely also that the brines found in oil fields and other deep-seated sedimentary strata are connate waters."

54. ——— Origin of the natural brines of oil fields. Johns Hopkins Univ. Circular, new series, No. 3, March, 1917, pp. 57–68. Results of a study of the brines found in the Appalachian oil sands, with the conclusion that they are connate o. ol ocean origin, and not of meteoric or surface origin.

55. Richardson, G. B. Note on Appalachian oil-field brine. Econ. Geol., vol. 12, January, 1917, pp. 39–41. Gives analyses of waters from deep Pennsylvania sands, and discusses briefly the factors controlling their composition.

56. ——— Note on the diffusion of sodium chloride in Appalachian oil-field waters. Jour. Wash. Acad. Sci., vol. 7, 1917, pp. 73–75. Study of water from deep wells of western Pennsylvania.

PROPERTIES AND THEIR DETERMINATION.

See No. 49.

STATISTICS.

57. **Petroleum Age.** Monthly statement shows average daily production and shipments in the Appalachian and Lima-Indiana fields, by months for five successive years.

See also Nos. 14–18, 20–38, 50.

INDIANA.

GEOLOGY AND ORIGIN.

57a. **Barrett, Edward.** Structural geology. Indiana Dept. Geol. and Nat. Resources, Forty-first Annual Rept., 1916 (Indianapolis, 1917), pp. 100–112. Classifies and describes oil-field structures, and reviews field development in Indiana during 1916.

58. **Bownocker, J. A.** Petroleum in Ohio and Indiana. Bull. Geol. Soc. Am., vol. 28, September, 1917, pp. 667–676. Describes the principal oil-producing rocks of Ohio and Indiana, the Trenton limestone field, and the Clinton sand field. Discusses Corniferous rocks as a source of oil in Indiana, and the Mississippian and Pennsylvanian as sources of petroleum in Ohio and Indiana.

58a. **Wright, F. E.** Oil and gas. Indiana Dept. Geol. and Nat. Resources, Forty-first Annual Rept., 1916 (Indianapolis, 1917), pp. 114–121. Suggests changes in the State law in regard to shutting off water, plugging and abandoning wells, and drilling in coal areas.

STATISTICS.

See Nos. 14–18, 20–38.

KENTUCKY.

GEOLOGY AND ORIGIN.

59. **Bell, Guy.** Petroleum prospects in Kentucky. Oil and Gas Jour., vol. 16, Oct. 25, 1917, pp. 42–43. Gives geologic facts in regard to prospective oil areas of eastern Kentucky.

60. **Gardner, J. H.** Kentucky as an oil State. Science, vol. 46, Sept. 21, 1917, pp. 279–280. Discusses future production and its dependence on four factors—structure, sand, water, and original oil. Concludes that the State will not rank high in production but valuable deposits may be found.

61. **Jones, J. W.** Report on Estill County oil fields. Oil and Gas Jour., vol. 15, Apr. 5, 1917, pp. 30–31. Gives geologic structure, topographic description, operating methods, and pipe-line facilities.

62. **Miller, A. M.** Table of geological formations for Kentucky. Lexington, Ky., 1917. 7 pp.

63. **National Petroleum News.** Find five oil-bearing strata in Kentucky. Vol. 9, October, 1917, pp. 98–99. Describes anticlines in eastern part of the State.

64. **Petroleum Age.** Kentucky to be wildcatters' paradise. Vol. 4, February, 1917, pp. 24a–24d. Describes present conditions of development and future prospects of the Irvine pool.

65. **Sears, M. A.** Paint Creek Dome in eastern Kentucky, Oil and Gas Jour., vol. 15, May 31, 1917, pp. 30, 35. A geological description of the region, and history of its development.

66. SHAW, E. W. The Irvine oil field, Estill County, Ky. U. S. Geol. Survey Bull. 661–D, 1917. 51 pp. A detailed geological study of the field, with suggestions for prospecting. Gives statistics of production, well data, analysis of the oil, and the composition of Ohio black shale found in the Irvine field. Abstract in Jour. Wash. Acad. Sci., vol. 7, Oct. 4, 1917, p. 514.

DEVELOPMENT AND PRODUCTION, *see* Nos. 61, 66; TRANSPORTATION, *see* No. 61; PROPERTIES AND THEIR DETERMINATION, *see* No. 66; REFINING AND REFINERIES, *see* No. 173; STATISTICS, *see* Nos. 14–18, 20–38, 66.

NEW YORK.

GEOLOGY AND ORIGIN, *see* No. 74.

PROPERTIES AND THEIR DETERMINATION.

67. ENGINEERING AND CONTRACTING. New York specifications for emulsified asphalt. Vol. 48, July 4, 1917, p. 9. Specifications of the State Commissioner of Highways of New York, 1916.

68. NATIONAL PETROLEUM NEWS. How New York City buys its lubricants. Vol. 8, January, 1917, pp. 26–30. Tells of specifications drawn up by the municipal bureau of standards for lubricating oils for the city. Quotes specifications for motor oils.

UTILIZATION, *see* Nos. 67, 68; STATISTICS, *see* Nos. 14–18, 20–38.

OHIO.

GEOLOGY AND ORIGIN.

69. GOLDMAN, M. I. Results of the microscopic examination of some rocks from the oil fields of southeastern Ohio. Jour. Wash. Acad. Sci., vol. 7, May 19, 1917, pp. 310–311. (Abstract.) Results of an investigation "to find any characters of the rocks that might bear on the distribution of oil in them," and of a study of the early stages of metamorphism and their relation to geologic conditions.

70. GRABAU, A. W. Age and stratigraphic relations of the Olentangy shale of central Ohio, with remarks on the Prout limestone and so-called Olentangy shales of northern Ohio. Jour. Geol., vol. 25, May–June, 1917, pp. 337–343.

71. PANYITY, L. S. The southern extremity of the "Clinton" gas pools in Ohio. Bull. Am. Inst. Min. Eng., June, 1917, pp. 963–967. Trans., vol. 57, 1918, pp. 984–988. Geological description of this region, and account of oil and gas development. Eng. and Min. Jour., vol. 104, Aug. 4, 1917, pp. 207–208. (Abstract.)

72. ROGERS, G. S. The Cleveland gas field, Cuyahoga County, Ohio, with a study of gas pressure. U. S. Geol. Survey Bull. 661–A, 1917. 68 pp. Gives history and development of the field, stratigraphy and structure, gas resources, and a detailed discussion of the decline of wells and the factors controlling production and life. Abstract, Jour. Wash. Acad. Sci., vol. 7, May 19, 1918, p. 308.

73. VAN HORN, F. R. Reservoir gas and oil in the vicinity of Cleveland, Ohio. Bull. Am. Inst. Min. Eng., January, 1917, pp. 75–86; discussion, April, pp. 621–622. Transactions, vol. 56, 1917, pp. 831–842. After an explanation of the difference between shale gas and reservoir gas, a historical outline of the development of the latter is given, and an account of present developments in Ohio. The chief producing sands are described, and logs of representative wells are given, as well as analyses of gas and distillation tests of oil from wells in the Cleveland district.

74. **Verweibe, W. A.** Correlation of the Devonian shales of Ohio and Pennsylvania. Am. Jour. Sci., vol. 44, July, 1917, pp. 33–47. Concludes that such correlation is a difficult problem, because paleontology and lithology are unsatisfactory guides; that the 750 feet of shales in central Ohio expand and are stratigraphically equivalent to the 2,700 feet of shale in western Pennsylvania; that the shales of Ohio should be subdivided into two parts rather than three—the upper predominately black colored, and lower predominately light colored; and gives correlation table of the various subdivisions in Ohio and Pennsylvania with those of New York.

75. ——— Correlation of the Mississippian of Ohio and Pennsylvania. Am. Jour. Sci., vol. 43, April, 1917, pp. 301–318. A detailed study of these formations. Their correlation is a problem not yet satisfactorily worked out. This paper attempts to correlate them in these two areas preliminary to a discussion of the Devonian. Numerous sections are given.

See also No. 58.

Transportation, *see* No. 549; Properties and their determination, *see* No. 763.

UTILIZATION.

76. **Wyer, S. S.** Ohio's fuel savings. Nat. Gas and Gasoline Jour., vol. 11, April, 1917, p. 80. Considers the cost of substitutes for natural gas fuel, such as coal gas, coke-oven gas, water gas, electricity, fuel oil, gasoline, alcohol, and acetylene.

Statistics, *see* Nos. 14–18, 20–38.

LEGAL REGULATIONS, ECONOMICS.

77. **Industrial Commission of Ohio, Bulletin.** Oil and gas well law of Ohio. Vol. 4, No. 7, June 1, 1917. 10 pp. Gives laws of the State governing the drilling, mapping, and plugging of wells in coal-bearing townships.

78. **Lantz, G. N.** Oil and gas wells in coal fields. Coal Age, vol. 11, Feb. 10, 1917, pp. 285–286. Suggests Ohio laws on this subject as basis for future laws for Pennsylvania.

See also No. 80.

79. **McKibben, G. L.** The natural gas situation in Cleveland during the winter of 1916–17. Jour. Cleveland Eng. Soc., vol. 10, September, 1917, pp. 113–125. Data on present and probable future production and consumption, with a view to finding a plan of action by consumers and companies to obtain satisfactory service.

80. **Pritchard, J. H.** Review of coal mining for 1916, Ohio. Coal Age, vol. 11, Jan. 13, 1917, pp. 54–57. Includes statement of the Ohio law which regulates the drilling of oil and gas wells in coal fields.

PENNSYLVANIA.

Geology and origin, *see* Nos. 74, 75.

DEVELOPMENT AND PRODUCTION.

81. **Gray, A. R.** Deep well drilling. Proc. Nat. Gas. Assoc. Am., vol. 9, 1917, pp. 382–397; discussion, pp. 397–398. Nat. Gas and Gasoline Jour., vol. 11, August, 1917, pp. 216–222. Describes deep wells in Pennsylvania and West Virginia, with details and well records.

82. **Oil and Gas Journal.** Drilling log of deep well at McDonald, Pa. Vol. 15, Mar. 8, 1917, p. 36. Gives log to 7,214 feet.

83. ——— Flooding of wells in Bradford field. Vol. 15, Feb. 22, 1917, p. 28. Describes method used in the Bradford field to force out dormant oil which is estimated as 25 per cent of the original content of the sand.

84. **Reeves, Frank.** Origin of the natural brines of oil fields. Johns Hopkins Univ. Circular, new series, March, 1917, pp. 57–68. Contributions to Geology, 1917, pp. 255–266. Shows that the brines of Pennsylvania and West Virginia are of connate rather than meteoric origin.

See also Nos. 53, 54, 55, 56.

TRANSPORTATION, STORAGE, AND DISTRIBUTION.

85. **Bernard, H. B.** Natural gas pumping station at Roystone. Power, vol. 45, Apr. 17, 1917, pp. 514–516. Gives details of system operated by the Pennsylvania Gas Co. at Roystone, Pa.

Statistics, *see* Nos. 14–18, 20–38; Legal regulations, *see* No. 78.

WEST VIRGINIA.

GEOLOGY AND ORIGIN.

86. **Hennen, R. V.** Clay and Braxton Counties. West Virginia Geol. Survey, County Reports, 1917. 883 pp. Accompanied by case of geologic and topographic maps. Chapter IX (pp. 278–454), on petroleum and natural gas, contains descriptions of the oil and gas horizons and oil and gas-bearing sands in these counties, detailed well records for each county, and locations of prospective oil and gas areas.

87. **Reger, D. B.** The possibility of deep-sand oil and gas in the Appalachian geo-syncline of West Virginia. Trans. Am. Inst. Min. Eng., vol. 56, 1917, pp. 856–871; discussion, pp. 872–875. Published first in Bull. Am. Inst. Min. Eng., September, 1916, pp. 1709–1724; discussion, April, 1917, pp. 622–626.

DEVELOPMENT AND PRODUCTION.

88. **Fanning, L. M.** Ohio Cities Gas Co.'s refinery and oil producing properties at Cabin Creek, W. Va. Oil Trade Jour., vol. 8, November, 1917, pp. 50–55. Describes refinery equipment and interesting operating features, and gives cost of construction and shipping facilities. Describes the company's producing properties, and gives data on cost of labor, materials, and drilling.

89. **Natural Gas Association of America.** Report of the committee on conservation. Proceedings, vol. 9, 1917, pp. 323–330. Discusses conservation of natural gas, the mudding process, and the recovery of natural-gas gasoline in West Virginia, Oklahoma, and Kansas.

See also Nos. 53, 54, 81, 84, 86.

Refining and refineries, *see* No. 88; Statistics, *see* Nos. 14–18, 20–38.

MAPS.

90. **West Virginia Geological Survey.** Coal, oil, gas, limestone, and iron-ore map. Oct. 1, 1917. Revised edition. Shows oil and gas pools of the State.

See also No. 86.

ILLINOIS FIELD.

ILLINOIS.

GEOLOGY AND ORIGIN.

91. **Blatchley, R. S.** Plymouth oil field. Illinois Geol. Survey, Bull. 23, 1917, pp. 51–53. Gives history of discovery of oil in this field, well records, and recommendations by the survey.

92. **Brokaw, A. D.** Oil investigations in Illinois in 1916. Parts of Saline, Johnson, Pope, and Williamson Counties. Illinois Geol. Survey, Bull. 35, 1917, pp. 19–37. Published also as separate, in abbreviated form, 1916. A geologic study of the region in relation to the accumulation of oil and gas, with recommendations for future drilling.

93. **Butts, Charles.** Oil investigations in Illinois in 1916. Parts of Hardin, Pope, and Saline Counties. Illinois Geol. Survey Bull. 35, 1917, pp. 75–78. Gives stratigraphy and structure of the region, with map, and locates possible oil-bearing strata.

94. **Hinds, Henry.** Geology and economic resources of Colchester and Macomb quadrangles. Illinois Geol. Survey, Bull. 30, 1917, pp. 75–108.

95. ——— Oil and gas in Colchester and Macomb quadrangles. Illinois Geol. Survey, Bull. 23, 1917, pp. 45–50. Describes geology of these quadrangles, and oil and gas deposits. Geological map is appended.

96. **Kay, F. H.** Oil fields of Illinois. Bull. Geol. Soc. Am., vol. 28, September, 1917, pp. 655–666. Describes stratigraphy and structure of the field, and conditions which affect accumulation and oil content per acre, with table of total production per acre for typical areas.

97. ——— Oil investigations in Illinois in 1916. Illinois State Geol. Survey Bull. 35, 1917. 78 pp. Includes the following reports: Petroleum in Illinois in 1916, by F. H. Kay; Parts of Saline, Williamson, Pope and Johnson Counties, by A. D. Brokaw; Parts of Williamson, Union, and Jackson Counties, by Stuart St. Clair; The Ava area, by Stuart St. Clair; The Centralia area, by Stuart St. Clair; Parts of Hardin, Pope, and Saline Counties, by Charles Butts. See also separate authors.

98. **St. Clair, Stuart.** Oil investigations in Illinois in 1916. Parts of Williamson, Union, and Jackson Counties. Illinois Geol. Survey, Bull. 35, 1917, pp. 39–55. Results of a reconnaissance of the territory to determine general structure, and to map the position and extent of areas where structural irregularities indicated possible accumulation of oil and gas. Gives geologic description, with diagrams and maps, and recommendations for drilling.

99. ——— Oil possibilities of Ava area. Illinois Geol. Survey, Bull. 35, 1917, pp. 57–65. A study of the structural relations of the area, with cross sections and map, a record of former drilling operations, and recommendations as to future drilling.

100. ——— Oil possibilities of Centralia area. Illinois Geol. Survey, Bull. 35, 1917, pp. 67–73. Geologic study of the area, with recommendations for drilling for oil and gas.

DEVELOPMENT AND PRODUCTION, *see* No. 96.

STATISTICS.

101. **Kay, F. H.** Petroleum in Illinois in 1916. Illinois Geol. Survey, Bull. 35, 1917, pp. 11–18. Statistical review of field development, production, and prices in Illinois during 1916.

102. **Skewes, H. J.** Mineral resources in Illinois in 1911 and 1912. Illinois Geol. Survey Bull. 23, 1917, pp. 25–44. Statistics on petroleum, natural gas, and gasoline.

103. ——— Mineral resources of Illinois in 1913 and 1914. Illinois Geol. Survey, Bull. 30, 1917, pp. 23–49. Includes statistics of petroleum, natural gas, asphalt, and casing-head gasoline. Tables give the history of oil production since 1889, and the fluctuation in prices for the years 1912–1914.

See also Nos. 14–18, 20–38.

MID-CONTINENT FIELD.

GEOLOGY AND ORIGIN.

104. GARDNER, J. H. The Mid-Continent oil fields. Bull. Geol. Soc. Am., vol. 28, September, 1917, pp. 685–720. Gives the stratigraphy and structure of the field, by States. Discusses the origin of Mid-Continent oil and the accumulation of oil and gas in the field. Enumerates and discusses important factors which create an oil field. Gives quality and analyses of the petroleum of each State in the field.

105. ——— The vertical component in local folding. Bull. Southwestern Assoc. Petroleum Geologists, vol. 1, 1917, pp. 107–109; discussion, pp. 109–110. Presents theory of vertical rather than lateral pressures in the folding of stratified rocks, and applies it especially to Mid-Continent oil-field structures.

106. HAGER, DORSEY. A few notes on the future work of the petroleum geologist in the Mid-Continent oil fields. Bull. Am. Inst. Min. Eng., October, 1917, pp. 1793–1795. Trans., vol. 57, 1918, pp. 891–893. States that chances of finding new pools in Kansas and Oklahoma are slight, therefore future work will consist of the development and extension of areas already proved productive. Points out importance of cooperation between geologist and operator.

107. NOWLAN, H. H. Geology of the Mid-Continent field. Oil City Derrick Supplement, Dec. 15, 1917, pp. 85–87, 91. General character of rock formations and types of structure found in this field.

DEVELOPMENT AND PRODUCTION.

108. STRAIGHT, H. R. Methods of drilling used by the Empire Gas & Fuel Co. in the Mid-Continent field. Doherty News, vol. 3, December, 1917, pp. 5–9. Explains cable tool, rotary, circulating, and combination systems of drilling. Describes methods used in the Kansas fields, such as the use of portable drilling machines for shallow wells. Discusses the problems of finding the best method of drilling in the soft Permian beds of western Oklahoma, and of drilling in the Pennsylvanian beds with less casing than usually is employed.

TRANSPORTARION, *see* No. 591; PROPERTIES AND THEIR DETERMINATION, *see* No. 104; STATISTICS, *see* Nos. 14–18, 20–38.

KANSAS.

HISTORICAL REFERENCES.

109. HAWORTH, ERASMUS. Historical outline of the oil and gas industry in Kansas. Kansas Geol. Survey Bull. 3, 1917, pp. 19–24. An outline of the history of the development of oil and gas in Kansas, which was published in vol. 9 of University Geological Survey, 1908, followed by a description of recent oil development through half of 1917.

GEOLOGY AND ORIGIN.

110. HINDS, HENRY, and GREENE, F. C. Leavenworth-Smithville Folio, Missouri-Kansas. U. S. Geol. Survey Geologic Atlas of the United States, Folio No. 206, 1917. Discusses in detail geology, mineral resources, and occurrence of oil and gas.

111. **Moore, R. C., and Haynes, W. P.** Oil and gas resources of Kansas. Kansas Geol. Survey Bull. 3, 1917. 391 pp. After chapters on the general geology of oil and gas and their important properties, and on production methods used in Kansas, gives the general stratigraphy of Kansas, with a description of the crystalline rocks of the State. Discusses present development in the oil and gas fields, and possible development in all parts of the State. The law relating to oil and gas in Kansas is appended. Chapters are given on the history of the oil and gas industries in Kansas by Erasmus Haworth, and on the physical and chemical properties of Kansas petroleums by W. A. Whitaker, F. W. Campbell, and Clarence Estes.

112. **Powers, Sidney.** Granite in Kansas. Am. Jour. Sci., vol. 44, August, 1917, pp. 146–150. Considers the age and formation of granite deposits found in wells drilled in Kansas. Gives list of wells in which granite was encountered, their location, and the depths at which the rock was found. (See also Haworth, Erasmus, on crystalline rocks in Kansas, Kansas Univ. Geol. Survey, Bull. 2, 1915. 33 pp.)

113. **Taylor, C. H.** The granites of Kansas. Bull. Southwestern Assoc. Petroleum Geologists, vol. 1, 1917, pp. 111–125; discussion, pp. 125–126. Statement of occurrence, discussion of structural relations, and age of granite deposits found in east-central Kansas in drilling for oil and gas. Gives list of wells in which granite was found, and two well logs.

114. **Twenhofel, W. H.** Granite bowlders in (?) the Pennsylvanian strata of Kansas. Am. Jour. Sci., vol. 43, May, 1917, pp. 363–380. Gives distribution, lithology, and characteristics of bowlders found in Wilson and Woodson Counties, with a view to explaining the occurrence of granite in deep wells in this vicinity. (See also Haworth, Erasmus. On crystalline rocks in Kansas. Kansas Geol. Survey Bull. 2, 1915.) Gives also their stratigraphy and probable geologic history.

115. **Wright, Park.** Granite in Kansas wells. Bull. Am. Inst. Min. Eng., August, 1917, pp. 1113–1120. Trans., vol. 57, 1918, pp. 906–913. Offers a theory for the presence of the granite, and draws conclusions which will aid in determining the prospective oil and gas value of the area studied.

See also Nos. 104, 239, 399.

DEVELOPMENT AND PRODUCTION.

116. **Shallenberger, G. C.** Water problem in Augusta oil field. Oil and Gas Jour., vol. 15, Mar. 8, 1917, p. 28. Discusses the application of the science of hydrostatics in attempting to solve the problem of water intrusion in oil wells of this field.

See also Nos. 89, 108, 111.

PROPERTIES AND THEIR DETERMINATION.

117. **Whitaker, W. A., Campbell, F. W., and Estes, Clarence.** The physical and chemical properties of Kansas petroleums. Kansas Geol. Survey Bull. 3, 1917, pp. 174–192. Reviews previous work on this subject, gives methods used in the present investigation, and data obtained.

See also No. 104, 111.

Refining and refineries, *see* No. 89.

STATISTICS.

118. **Boynton, A. J.** The economic resources of the Kansas City zone. Jour. Ind. and Eng. Chem., vol. 9, July, 1917, pp. 700–705. Includes short statistical reviews of the oil and gas industries of this region.

See also Nos. 14–18, 20–38.

Maps, *see* No. 110; **Legal regulations,** *see* No. 111.

LOUISIANA, NORTHERN.

GEOLOGY AND ORIGIN.

119. **Matson, G. C., and Hopkins, O. B.** The De Soto-Red River oil and gas field, Louisiana. U. S. Geol. Survey Bull. 661–C, 1917. 40 pp. Gives stratigraphy and structure of the field, and describes in detail the oil and gas-bearing formations. Discusses the relation of the occurrence of oil and gas to the structure of the sands and associated formations. Gives analyses of the oil and gas found in this field, and statistics of production.

120. **Pallfelt, H. A.** The petroleum industry in Louisiana. Proc. Louisiana Eng. Soc., vol. 3, February, 1917, pp. 17–32. Oildom, vol. 7, April, 1917, pp. 170, 172. Gives briefly the geologic formations of the fields, and the occurrence of oil and gas, and reviews the development of the industry in the State.

See also No. 104.

Properties and their determination, *see* Nos. 104, 119.

STATISTICS.

Production.

121. Oil Trade Journal. Texas and Louisiana output. Monthly statement.

See also Nos. 14–18, 20–38, 119.

LEGAL REGULATIONS.

122. **Department of the Interior.** Report of the Commissioner of the General Land Office to the Secretary of the Interior for the fiscal year ended June 30, 1917. Washington, 1917. 149 pp. Contains (pp. 3–13) a review of the oil land situation in California, Wyoming, and Louisiana (Caddo Lake lands).

OKLAHOMA.

GEOLOGY AND ORIGIN.

123. **Aurin, Fritz.** Correlation of the oil sands of Oklahoma. Oklahoma Geol. Survey Circular 7, October, 1917. 16 pp. Incorporated also in Oklahoma Geol. Survey Bull. 19, part 2, 1917. (See No. 138.) Discusses the use of well logs in correlating sands, and general problems in the correlation of sands in the Pennsylvanian. Describes the main productive horizons of the State. Concludes with the logs of several wells, which show the general characteristics of the oil and gas fields of Oklahoma.

124. **Beal, C. H.** Geologic structure in the Cushing oil and gas field, Oklahoma, and its relation to the oil, gas, and water. U. S. Geol. Survey Bull. 658, 1917. 64 pp. Prepared in cooperation with the Bureau of Mines. Abstract in Bull. Am. Inst. Min. Eng., August, 1917, pp. 1101–1112. Trans. Am. Inst. Min. Eng., vol. 57, 1918, pp. 894–905. Results of a study of the formations containing oil, gas, and water, and the relations of these substances in the formations, with a view to aiding in the work of conservation of oil and gas in this and other fields by showing the value of geology in developing and operating a field.

125. **Bloesch, Edward.** North-south correlation of the Pennsylvanian of Oklahoma. Bull. Southwestern Assoc. Petroleum Geologists, vol. 1, 1917, pp. 134–135.

126. BLOESCH, EDWARD. Observations in the post-Permian deposits in north-central Oklahoma. Bull. Southwestern Assoc. Petroleum Geologists, vol. 1, 1917, pp. 136–139. Results of a study of the structural geology of Garfield and surrounding counties.

127. CONKLING, R. A. The influence of the movement in shales on the area of oil production. (Cushing field, Oklahoma.) Trans. Am. Inst. Min. Eng., vol. 56, 1917, pp. 876–879; discussion, pp. 879–880. Published also in Bull. Am. Inst. Min. Eng., November, 1916, pp. 1969–1972; discussion, March, 1917, pp. 389–390; April, 1917, p. 620; June, 1917, p. 985.

128. FATH, A. E. An anticlinal fold near Billings, Noble County, Okla. U. S. Geol. Survey Bull. 641, 1917, pp. 121–138. Published also as separate Bull. 641–E, 1916. The geology and formation of the anticline are described relative to the possibilities of oil and gas, which are found 20 miles from the anticline. Gives well records.

129. ——— Structure of the northern part of the Bristow Quadrangle, Creek County, Okla., with reference to petroleum and natural gas. U. S. Geol. Survey Bull. 661–B, 1917. 31 pp. A study of the geology of the region, with conclusions as to prospective oil and gas areas. Points out actual localities which show favorable structure.

130. HAGER, DORSEY. The evidence of the Oklahoma oil fields on the anticlinal theory. Bull. Am. Inst. Min. Eng., February, 1917, pp. 195–198; discussion, April, 1917, pp. 626–635. Transactions, vol. 56, 1917, pp. 843–846; discussion, pp. 846–855. In application of the anticlinal theory and the value of geology in the Oklahoma and Kansas oil fields, a list is given of the productive fields or pools in these States, with types of fold domes, anticlines, or terraces, and the manner in which they were found, whether by geologic study or by wildcatting. Concludes that the theory holds and that the geologist is playing an important part in the development of the fields.

131. HEALD, K. C. The oil and gas geology of the Foraker quadrangle, Osage County, Okla. U. S. Geol. Survey Bull. 641, 1917, pp. 17–47. Published also as separate Bull. 641–B, 1916. Discusses the character of the surface of the region, the accessibility of different parts of the quadrangle, its stratigraphy and structure. Sets forth the probability of the occurrence of oil and gas, and makes specific recommendations for prospecting.

132. JILLSON, W. R. Preliminary note on the occurrence of vertebrate footprints in the Pennsylvanian of Oklahoma. Am. Jour. Sci., vol. 44, July, 1917, pp. 56–58. Describes fossil footprints found in a sandstone member of the Middle or Lower Pennsylvanian in the Osage Nation, near Pawhuska, in a horizon correlated with the upper part of the Le Roy shales of Kansas.

133. MATHER, K. F. Pottsville formations and faunas of Arkansas and Oklahoma. Am. Jour, Sci., vol. 43, February, 1917, pp. 133–139.

134. OIL AND GAS JOURNAL. Prospective oil areas, Pontotoc County, Okla. Vol. 16, Aug. 9, 1917, p. 34. Gives brief description of these areas and suggestions as to test drilling.

135. POWERS, SIDNEY. Age of the oil in southern Oklahoma fields. Bull. Am. Inst. Min. Eng., November, 1917, pp. 1971–1982; discussion, March, 1918, pp. 708–709; April, 1918, p. 842. From a detailed geological study it is concluded that the southern Oklahoma fields except Fox and Healdton, yield petroleum from Permian strata, whence it migrated from Pennsylvanian or older sands; that the Fox, Healdton, and Graham fields produce oil from the Pennsylvanian sands; and that at Healdton the anticlinal structure is buried beneath sediments of both Permian and Pennsylvanian, which are conformable but deposited on an upturned mass of Ordovician strata from which no oil is, or will be, produced.

136. POWERS, SIDNEY. The Healdton oil field, Oklahoma. Econ. Geol., vol. 12, October–November, 1917, pp. 594–606. Gives general geologic structure, detailed Healdton structure, and character of the oil with gravity determinations. Discusses probable future development.

137. ——— Ordovician strata beneath the Healdton oil field, Oklahoma. Paper read before the Geological Society of America. Abstract, Bull. Geol. Soc. Am., vol. 28, March, 1917, p. 159. States that the oil of Healdton field occurs largely in Permian sands, but may have been derived from underlying Pennsylvanian or older beds; that fossils from Carter County have been identified as of Ordovician age, and that pronounced unconformities must exist beneath several of the southern Oklahoma oil fields in order to account for pre-Permian rocks at Healdton and Loco, and for variations in the well logs.

138. SHANNON, C. W., AND OTHERS. Petroleum and natural gas in Oklahoma. Part 2. A discussion of the oil and gas fields and undeveloped areas of the State, by counties. Oklahoma Geol. Survey Bull. 19, part 2, 1917. 536 pp. Part 1 published in 1915. Covers past and present development and possibilities of future development of each oil field.

139. SNIDER, L. C. Geography of Oklahoma. Oklahoma Geol. Survey Bull. 27, 1917. 325 pp. Contains chapters on the general geology of the State, detailed geology and geologic history of Oklahoma and its mineral resources, with brief discussions of these subjects for each county.

See also No. 104.

DEVELOPMENT AND PRODUCTION.

140. BURTON, G. E. Methods of exploring for oil and gas. Oklahoma Geol. Survey Circular 8, July, 1917. 20 pp. Discusses the following methods: (1) Securing a block of leases and making churn drill tests; (2) geological examination of the surface in search of favorable structures and drilling of churn drill holes; (3) the use of the diamond drill. Explains the structural contour method and the dip and strike method of showing the attitude of a stratum from drill hole data. Gives data on the cost of drilling oil and gas wells. (See also Eng. and Min. Jour., vol. 104, Sept. 8, 1917, p. 446.)

141. NOLAND, E. T. Fire and explosive hazards in the Oklahoma oil fields. Manufac. Rec., vol. 72, July 19, 1917, p. 70d. General considerations as to dangers from fire in drilling for and in storing and handling oil.

See also Nos. 89, 108, 406, 505.

TRANSPORTATION, STORAGE, AND DISTRIBUTION.

142. PETERSON, F. P. Proper handling of pipe lines the secret of casinghead yield. Nat. Petroleum News, vol. 9, August, 1917, pp. 46, 48. Discusses the necessity for care in pipe line provision for gathering the gas, particularly in Oklahoma. Enumerates points of special importance in their construction and operation.

See also No. 141.

PROPERTIES AND THEIR DETERMINATION, *see* Nos. 104, 136.

REFINING AND REFINERIES.

143. MCINTYRE, JAMES. Oklahoma produces 350,000 gallons. Oil and Gas Jour., vol. 16, Aug. 16, 1917, pp. 29–31, 33. Review of the casing-head gasoline industry in Oklahoma, giving, in addition to production figures, the yield of gasoline from the oils of various pools in the State, the estimated cost of plants, and a list of plants in operation in the State, with their daily capacity.

See also Nos. 89, 142.

STATISTICS, *see* Nos. 14–18, 20–38, 143, 405.

MAPS.

144. **Burke, M. P.** Burke's township plats of the oil fields in north-central Oklahoma. Tulsa, Okla.: Tulsa Indian Trading Co., 1917. 395 pp. of plans. Folding map. $25.

LEGAL REGULATIONS.

145. **Corporation Commission of Oklahoma.** Rules, regulations, and requirements governing the conservation of natural gas and crude oil, or petroleum, in the State of Oklahoma. Cause No. 2935. Order No. 1299. Prescribes 41 rules, effective August 20, 1917, intended to prevent waste in the drilling of oil and gas wells in the State.

146. **Oil and Gas Journal.** Regulations on casing-head gasoline. Vol. 16, Aug. 23, 1917, p. 30. Gives text of rules adopted by the Department of the Interior to govern the utilization of casing-head gas produced from oil wells on restricted Indian land, not including the Osage Nation. Includes a table of royalties to be paid by the lessee to the Indian lessor.

TEXAS, EASTERN, CENTRAL, AND NORTHERN.

GEOLOGY AND ORIGIN.

147. **Baker, C. L., and Bowman, W. F.** Geologic exploration of the southeastern front range of Trans-Pecos Texas. Bull. Univ. Texas, No. 1753, Sept. 20, 1917, pp. 61–177.

148. **Böse, Emil.** Geological conditions near Bridgeport and Chico, Wise County, Tex., with special reference to the occurrence of oil. Bull. Univ. Texas, No. 1758, Oct. 15, 1917. 31 pp. Gives geology of the region, and discusses the possibilities of finding oil.

149. **Drake, N. F.** Report on the Colorado coal field of Texas. Bull. Univ. Texas, No. 1755, Oct. 1, 1917. 75 pp. Includes, beside a detailed geologic description of the region, an account of its economic geology, including oil and gas occurrence.

150. **Matson, G. C., and Hopkins, O. B.** The Corsicana oil and gas field, Texas. U. S. Geol. Survey Bull. 661–F, 1917. 42 pp. Detailed results of an investigation of the history, production, and geology of this field, especially in regard to types of structure and the age and relations of the different sands. Analyses of the oil and gas and statistics of production are given.

151. **Phillips, W. B.** The sulphur deposits in Culberson County, Tex. Bull. Am. Inst. Min. Eng., September, 1917, pp. 1449–1466; discussion, January, 1918, pp. 70–71. Includes a log of a well drilled by the Texas Petroleum Co. which showed no deposits of sulphur, but small quantities of oil and gas. In a summary of the fuel resources of the region, mentions shallow wells which produce lubricating oil of good quality.

152. **Udden, J. A.** Notes on the geology of the Glass Mountains. Bull. Univ. Texas, No. 1753, Sept. 20, 1917, pp. 3–59. Describes occurrences of oil in this region, and discusses the possibility of the existence of oil-bearing formations.

153. **Wrather, W. E.** Notes on the Texas Permian. Bull. Southwestern Assoc. Petroleum Geologists, vol. 1, 1917, pp. 93–106. A study of geologic sections in Texas, and a comparison with the records of the boring at Spur. (See Udden, J. A. The deep boring at Spur. Bull. Univ. Texas, October, 1914.) Includes also notes on the stratigraphy of the Permian of the Pecos Valley in southeastern New Mexico.

See also No. 104.

PROPERTIES AND THEIR DETERMINATION.

154. SCOTT, A. C. The fuels of Texas. Coal Age, vol. 11, Apr. 14, 1917, pp. 658–661. A review of the coal, wood, lignite, oil, and gas resources of the State. Gives general location of the oil and gas fields, analyses of fuel oils, and calorific value of oil and gas, with discussion of their economic value as fuels.

See also Nos. 104, 150.

UTILIZATION, *see* No. 154.

STATISTICS.

PRODUCTION.

155. Oil Trade Journal. Texas and Louisiana output. Monthly statement. January–December, 1917.

See also Nos. 14–18, 20–38, 150.

LEGAL REGULATIONS.

156. OIL AND GAS JOURNAL. Amendment of Texas land enactments. Vol. 15, Mar. 15, 1917, pp. 30–31. Discusses good and bad points of House bill 676, which amends laws relating to the matter of obtaining pubic lands for the development of mineral industries.

MISSOURI.

STATISTICS.

156a. MISSOURI BUREAU OF GEOLOGY AND MINES. Biennial report of the State Geologist, 1917. Rolla, 1917. 75 pp. Gives production of petroleum and natural gas.

GULF COAST FIELD.

DEVELOPMENT AND PRODUCTION.

157. OIL TRADE JOURNAL. Cost of producing oil in the Coastal fields. Vol. 8, December, 1917, p. 80. States that the consensus of opinion of representative companies in this region places the cost per barrel at not less than $1, and in some cases at $1.50.

STATISTICS, *see* Nos. 14–18, 20–38.

LOUISIANA, COASTAL.

GEOLOGY AND ORIGIN.

158. KENNEDY, W. B. Coastal salt domes. Bull. Southwestern Assoc. Petroleum Geologists, vol. 1, 1917, pp. 34–59. Study of the geology of the coastal region as shown by well records and fossils. Describes gas mounds, and discusses their origin. Describes structure of larger domes of various types, and discusses their age and origin.

159. LUCAS, A. F. A review of the exploration at Belle Isle, La. Bull. Am. Inst. Min. Eng., September, 1917, pp. 1435–1447; discussion, January, 1918, pp. 88–92. Trans., vol. 57, 1918, pp. 1034–1046; discussion, pp. 1046–1049. Gives account of early and recent work of drilling wells to ascertain the extent of the salt and sulphur deposits of this island, and sums up the geology of the locality. Gives well logs showing oil, gas, salt, and sulphur.

160. **Shaw, E. W.** Possibility of using gravity anomalies in the search for salt-dome oil and gas pools. Science, vol. 46, Dec. 7, 1917, pp. 553–556. Suggests that concealed salt domes of the Louisiana and Texas coastal plain perhaps may be located by determinations of gravity anomalies. Great pools of oil are associated with some of the salt domes, and this method offers a means of prospecting.

See also Nos. 120, 317.

DEVELOPMENT AND PRODUCTION.

161. **Natural Gas and Gasoline Journal.** Great southwestern well. Vol. 11, June, 1917, pp. 158–159. Describes the closing-in of a wild gas well near Houma, La.

162. **Rickard, T. A.** Anthony F. Lucas and the Beaumont gusher. Min. and Sci. Press, vol. 115, Dec. 22, 1917, pp. 887–894. West. Eng., vol. 9, January, 1918, pp. 13–20. An interview with Capt. Lucas which gives details of oil discovery and development in Texas and Louisiana. Includes description of special methods used in drilling and controlling the Spindle Top gusher.

Transportation, *see* No. 545.

STATISTICS.

Field development and production.

163. **Oil Trade Journal.** Monthly statement of Gulf coast drilling operations, and of Texas and Louisiana output.

See also Nos. 14–18, 20–38.

TEXAS, COASTAL AND SOUTHERN.

GEOLOGY AND ORIGIN.

164. **Deussen, Alexander.** The Humble (Tex.) oil field. Bull. Southwestern Assoc. Petroleum Geologists, vol. 1, 1917, pp. 60–79; discussion, pp. 79–84. Gives history of the field, its geology, typical well logs, an analysis of the oil, drilling methods used, and cost of wells.

165. **Hopkins, O. B.** The Palestine salt dome, Anderson County, Tex. The Brenham salt dome, Washington and Austin Counties, Tex. U. S. Geol. Survey Bull. 661–G, 1917. 22 pp. States that the absence of oil and gas as surface seepages and in shallow wells in the Palestine dome detracts from the oil prospects of the locality; and that drilling for oil in the Brenham dome has been discouraged. Suggestions are made, however, for further drilling.

166. **Phillips, W. B.** The so-called salt domes or mounds of Texas. Manufac. Rec., vol. 71, May 24, 1917, p. 62. Gives location of known salt domes in the Gulf Coastal Plain and data concerning them.

See also Nos. 158, 160, 284, 317.

Development and production, *see* Nos. 162, 164; **Properties and determination**, *see* Nos. 154, 164; **Utilization**, *see* No. 154.

STATISTICS.

Field development and production.

167. **Oil Trade Journal.** Monthly statement of Gulf coast drilling operations and Texas and Louisiana output.

See also Nos. 14–18, 20–38.

ROCKY MOUNTAIN FIELD.

GEOLOGY AND ORIGIN.

168. **Tomlinson**, C. W. The middle Paleozoic stratigraphy of the central Rocky Mountain region. Jour. Geol., vol. 25, 1917, pp. 112–134, 244–257, 373–394.

Statistics, *see* Nos. 14–18, 20–38.

COLORADO.

GEOLOGY AND ORIGIN.

169. **George**, R. D. Petroleum geology of Colorado. Mining American, vol. 75. July 21, 1917, pp. 11–13. Gives location of the anticlines and domes in the State, and discusses oil possibilities.

170. ——— Undeveloped oil regions in Colorado. Oil and Gas Jour., vol. 15, Apr. 26, 1917, pp. 34. Discusses the probabilities of finding undeveloped oil fields in this State. Describes definite conditions necessary for the accumulation of oil, and after applying these tests to Colorado, concludes that there exist the right kinds of rock formations, oil seeps, and asphalt deposits. Mentions three known oil fields already profitable.

171. **Lee**, W. T. Relations of the Morrison and Sundance formations. Jour. Wash. Acad. Sci., vol. 7, July 19, 1917, pp. 431–432. (Abstract.)

172. **Winchester**, D. E. Oil shale in northwestern Colorado and adjacent areas. U. S. Geol. Survey Bull. 641, 1917, pp. 139–198. Published also as separate Bull. 641–F, 1916. Jour. Wash. Acad. Sci, vol. 7, May 4, 1917, p. 265 (Abstract). With a view to showing the quantity and quality of the oil that may be distilled from the richer shale beds of this region, a study was made of its geology, and tests made of the shale found. Numerous stratigraphic sections are given to show the character of the rocks exposed. Detailed description is given of the tests made, and the apparatus used and results tabulated to show the yields of the different products.

See also No. 6.

REFINING AND REFINERIES.

173. **Allen** M. A. The supply of gasoline. West, Eng., vol. 8, November, 1917, pp. 436–437. Considers the possible source of gasoline in the natural bitumens, such as albertite and uintaite, as found in Utah, Oklahoma, and Colorado; in Kentucky cannel coal; and in the shales of Utah and Colorado.

STATISTICS.

Statistics, *see* Nos. 14–18, 20–38.

MONTANA.

GEOLOGY AND ORIGIN.

174. **Calvert**, W. R. Geology of the Upper Stillwater Basin, Stillwater, and Carbon Counties, Mont., with special reference to coal and oil. U. S. Geol. Survey Bull. 641, 1917, pp. 199–214. Published also as separate Bull. 641–G, 1916. Geologic study of the region and brief statement as to the prospects of finding oil. Tells of unsuccessful attempt to obtain oil by drilling.

175. **Collier, A. J.** The Bowdoin Dome, Mont., a possible reservoir of oil or gas. U. S. Geol. Survey Bull. 661–E, 1917. 17 pp. A study of the stratigraphy and structure of the dome, with conclusion that a test for oil would be sufficiently warranted by the structure, the positions of possible sources of oil, and the actual discovery of a small flow of gas.

176. **Hares, C. J.** The southern extension of the Eagle sandstone and its relation to the Niobrara shale in Wyoming. Jour. Wash. Acad. Sci., vol. 7, July 19, 1917, pp. 429–431 (Abstract).

177. **Stebinger, Eugene.** Anticlines in the Blackfeet Indian Reservation, Mont. U. S. Geol. Survey Bull. 641, 1917, pp. 281–305. Published also as separate Bull. 641–J, 1917. Jour. Wash. Acad. Sci., vol. 7, May 4, 1917, pp. 264–265 (Abstract). A study of the general geologic formation of the reservation, and a detailed description of the formations that appear to contain oil or gas in southern Alberta and northern Montana, with a view to further search for oil and gas in this region.

178. ——— Possibilities of oil and gas in north-central Montana. U. S. Geol. Survey Bull. 641, 1917, pp. 49–91. Published also as separate Bull. 641–C, 1916. Jour. Wash. Acad. Sci., vol. 7, Feb. 4, 1917, p. 77 (Abstract). Reviews the geologic structure and formation similar to that of other near-by fields.

179. ——— Stratigraphy of the Two Medicine formation (Montana). U. S. Geol. Survey Prof. Paper 103, 1917, pp. 1–3.

UTAH.

History and geographic occurrence, *see* No. 181.

GEOLOGY AND ORIGIN.

180. **Child, W. H.** Utah as an oil-producing State. Mining American, vol. 75, Dec. 22, 1917, pp. 7–8. Describes occurrences, and discusses prospects in Utah.

181. **Robinson, H. M.** Ozokerite in central Utah. U. S. Geol. Survey Bull. 641, 1917, pp. 1–16. Published also as separate Bull. 641–A. 1916. Gives location of the field, its history, and geology; composition and properties of the material, tests applied to it, and its mode of occurrence and origin. Comparisons are made with the Galician product. Mines now in operation are described, and future prospects of the field discussed.

See also No. 6.

Properties and their determination, *see* Nos. 181, 763; **Refining and refineries**, *see* Nos. 173, 181; **Utilization**, *see* No. 181; **Statistics**, *see* Nos. 14–18, 20–38.

WYOMING.

GEOLOGY AND ORIGIN.

182. **Hares, C. J.** Anticlines in central Wyoming. U. S. Geol. Survey Bull, 641, 1917, pp. 233–279. Published also as separate Bull. 641–I, 1916. Jour. Wash. Acad. Sci., vol. 7, May 4, 1917, p. 265 (Abstract). Results of a detailed study of geological formations, folds, and domes, in order to ascertain the possibilities of oil and gas. Concludes that, although wells already drilled have not been successful, there are favorable conditions for the accumulation of oil and gas, and that anticlines have not been thoroughly prospected.

183. **Hewett, D. F., and Lupton, C. T.** Anticlines in the southern part of the Big Horn Basin, Wyo.: A preliminary report on the occurrence of oil. U. S. Geol. Survey Bull. 656, 1917. 192 pp. Gives detailed geological description of the Big Horn Basin; mode of occurrence of oil and gas in the basin and in other Wyoming fields; physical and chemical properties of the oil and gas; general development in the various fields; and detailed descriptions of development of domes and anticlines.

184. . **Knight, S. H.** Age and origin of the red beds of southeastern Wyoming. (Abstract.) Bull. Geol. Soc. Am., vol. 28, March, 1917, pp. 168–169. Discusses the dividing line between the Paleozoic and Mesozoic in the northern part of the Rocky Mountain Range.

185. **Moore, P. T.** Wyoming's oil pools and prospects as viewed by an observer from the Mid-Continent. Oil Trade Jour., vol. 8, October, 1917, pp. 3–4, 6, 8, 10, 12, 14, 16, 18–20. General review of conditions in the Wyoming oil fields, including a description of the oil-producing formations, quality of the crudes produced, refinery capacities, statistics of a year's production by counties, and of two years' production by companies. Includes a discussion of Government land withdrawals and their effect on development.

186. **Trumbull, L. W.** The petroleum geology of Wyoming. Cheyenne, Wyo. G. G. Bovee, 1917. 81 pp. The historical and structural geology of the State are discussed and illustrated freely with columnar sections and cross sections. The various oil fields are described, and typical well logs given. Favorable unprospected and unfavorable tested areas also are discussed.

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188. **Ziegler, Victor.** The Byron oil and gas field, Big Horn County. Wyoming Geol. Survey, Bull. 14, 1917. 27 pp. Gives detailed geologic description of the field, the mode of occurrence of the oil and gas, and typical well logs.

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See also Nos. 42, 122, 185.

Properties and their determination, *see* Nos. 183, 185; Statistics, *see* Nos. 14–18, 20–38, 185.

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GEOLOGY AND ORIGIN.

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Utilization, *see* No. 1040.

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198. **JOHNSON, H. R.** A promising anticline at Merced Hills. Oil and Gas Jour., vol. 15, Mar. 15, 1917, p. 29. Short description of a new field in southern California.

199. **OIL AND GAS JOURNAL.** Early oil discovery in a California city. Vol. 15, Mar. 8, 1917, p. 35. Tells of the discovery of oil in Los Angeles in 1857 and of other early discoveries in this vicinity.

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See also No. 537.

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See also No. 197.

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See also Nos. 215, 1039.

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See also Nos. 195, 197.

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222. OIL AGE. Monthly statement of new companies.

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Utilization, *see* No. 1411.

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See also No. 248.

246. Miser, H. D. Structure of the Waynesboro quadrangle, with special reference to oil and gas. Resources of Tennessee, vol. 7, October, 1917, pp. 199–219. Detailed structural study of the region to ascertain the possibility of finding commercial deposits of oil and gas. Includes an account of indications already found, a well record, a review of the conditions necessary for the accumulation of oil and gas generally, and a discussion of the possibilities of such accumulation in this quadrangle.

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See No. 245.

CANADA (112).

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See also Nos. 1479, 1480.

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See also No. 408.

PROPERTIES AND THEIR DETERMINATION, *see* Nos. 251, 266.

UTILIZATION.

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See also Nos. 255, 256.

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MEXICO (113).

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See also Nos. 1, 43, 44.

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284. Hartley, Burton. The petroleum geology of the Isthmus of Tehuantepec. Econ. Geol., vol. 12, October–November, 1917, pp. 581–588. Describes Isthmus salt domes from which petroleum is obtained, and points out similarities between these domes and those of the United States (Texas) and Europe.

See also Nos. 280, 391, 1480.

DEVELOPMENT AND PRODUCTION.

285. HAZLETT, A. J. Drilling a well in Mexico is a costly operation. Oil Trade Jour., vol. 8, May, 1917, p. 70. Gives cost of drilling equipment and labor.

TRANSPORTATION, *see* No. 277.

PROPERTIES AND THEIR DETERMINATION.

286. BOLETIN DEL PETROLEO. Analisis de petroleo crudo procedente de distintas regiones mexicana. (Analyses of crude petroleum from different parts of Mexico.) Vol. 4, October, 1917, pp. 320–323.

286a. DE IBARROLA, A. M. Analisis de una nafta (Analysis of naphtha). An. Instit. Geol. de Méx., No. 4, 1917, pp. 23–30.

287. MORALES, S. S. Análisis de un petróleo crudo. (Analysis of a crude petroleum.) Bol. del Petróleo, vol. 4, November, 1917, pp. 429–434. Gives detailed study of a sample of oil from Tuxpan. The analysis is among the first made in the new laboratory of the Geologic Institute of Mexico. *See also* An. Instit. Geol. Méx., No. 4, 1917, pp. 1–19.

See also Nos. 277, 280.

REFINING AND REFINERIES, *see* No. 277; UTILIZATION, see Nos. 277, 280.

STATISTICS.

EXPORTS.

288. OIL TRADE JOURNAL. Monthly statement of shipments of oil from Tampico and Tuxpan into the United States, by points of destination. January–December, 1917.

IMPORTS.

289. UNITED STATES GEOLOGICAL SURVEY. Mineral Resources of the United States, part 2, Nonmetals. Annual statement of petroleum and petroleum products imported into Mexico from the United States.

PRODUCTION OF PETROLEUM, NATURAL GAS, AND ASPHALT.

290. UNITED STATES GEOLOGICAL SURVEY. Mineral Resources of the United States, part 2, Nonmetals. Gives annual production statistics.

See also No. 277.

LEGAL REGULATIONS.

291. BOLETIN DEL PETRÓLEO. Proyecto de ley del petróleo en los Estados Unidos Mexicanos y sus fundamentos, estuiados en el Departamento de Petróleo. Vol. 4, December, 1917, pp. 538–570. Gives the provisions of the Mexican petroleum law, and explains its principles.

292. MINING AND OIL BULLETIN. The new constitution of Mexico. Vol. 3, April, 1917, pp. 123–124, 127. Gives extracts from the constitution interesting to mining and oil operators.

293. PETROLEUM. Scale of taxes on Mexican oil is made public. Vol. 4, November, 1917, p. 133. Partial translation of the statement of the tax, and the reasons for its basis and assessment.

294. PETROLEUM REVIEW. A blow to the Mexican petroleum industry. Vol. 36, May 19, 1917, pp. 349–350. A criticism of the new policy of taxation of petroleum and its products in Mexico. (See also No. 295 for refutation.)

295. Santaella, Joaquín. Refutacion al articulo de "The Petroleum Review," de fecha 19 de Mayo de 1917 (in regard to the new oil taxation decree). Bol. de Petroleo, vol. 4, September, 1917, pp. 215–225. Refutation of an editorial in Petroleum Rev., vol. 36, May 19, 1917, pp. 349–350, which attempts to show that the new policy is shortsighted and will prove disastrous to the Mexican oil industry. The English article is translated in full, and each point of criticism defended.

See No. 294.

ECONOMICS.

295a Marvin, George. The jeopardy of Tampico. World's Work, vol. 34, Aug., 1917, pp. 374–387. Discusses strategic and economic importance of the Mexican oil fields in the World War.

CENTRAL AMERICA (113).

OCCURRENCE, *see* Nos. 1, 43, 44.

STATISTICS.

296. UNITED STATES GEOLOGICAL SURVEY. Mineral Resources of the United States, part 2, Nonmetals. Gives annual production statistics for petroleum, natural gas, and asphalt.

WEST INDIES (114).

OCCURRENCE, *see* Nos. 1, 43, 44.

STATISTICS.

297. UNITED STATES GEOLOGICAL SURVEY. Mineral Resources of the United States, part 2, Nonmetals. Annual production of petroleum and asphalt in the West Indies.

BARBADOS.

STATISTICS, *see* No. 297.

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CUBA.

HISTORICAL REFERENCES AND GEOGRAPHIC OCCURRENCE.

299. ENGINEERING AND MINING JOURNAL. First producing oil well in Cuba. Vol. 104, July 28, 1917, p. 168. Brief account of the discovery of oil in commercial quantities in Cuba, and review of the conditions.

300. GILLESPIE, F. K. The real facts as to the Cuban petroleum situation. What has been done, what is being done, and what may be expected in island developments. Oil, Paint, and Drug Rep., vol. 92, July 2, 1917, p. 61; July 9, p. 50F; July 16, p. 50F; July 23, pp. 56, 59; July 30, pp. 56, 59. Detailed account of operations.

301. KNIGHT, J. V. The oil industry on the island of Cuba. Evening Post Oil Industry Supplement, New York, Aug. 31, 1917, pp. 40, 42. Short account of the occurrence of oil on the island, and brief description of each of the 25 "developments" in progress.

302. OIL AND GAS JOURNAL. Recent developments in isle of Cuba. Vol. 16, June 21, 1917, p. 30. Tells of general conditions in Havana Province, and reviews briefly development there since September, 1916.

GEOLOGY.

303. **Hayes, C. W., Vaughan, T. W., and Spencer, A. C.** Informe sobre un reconocimiento geológico de Cuba. Translated, with annotations, by Pablo Ortega y Ros, from "Report on a geological reconnaissance of Cuba," Washington, 1901. Boletín de minas, Dirección de Montes y Minas, Cuba, January, 1917, pp. 3–63; July, 1917, pp. 63–162.

Statistics, *see* No. 297.

TRINIDAD.

HISTORICAL REFERENCES AND GEOGRAPHIC OCCURRENCE.

304. **Scientific American Supplement.** Asphalt. Where it comes from and some of its characteristics. Vol. 84, Sept. 1, 1917, pp. 136–137. Describes Trinidad Pitch Lake and the properties of the asphalt found there.

See also No. 327.

Properties and their determination, *see* Nos. 304, 691; Statistics, *see* No. 297.

OTHER ISLANDS.

PORTO RICO.

STATISTICS.

305. **United States Bureau of Foreign and Domestic Commerce.** Monthly summary of foreign commerce of the United States. Gives quantity and value of crude and refined mineral oil shipped to Porto Rico.

SOUTH AMERICA (120).

HISTORICAL REFERENCES AND GEOGRAPHIC OCCURRENCE.

306. Clapp, F. G. Review of present knowledge regarding the petroleum resources of South America. Bull. Am. Inst. Min. Eng., October, 1917, pp. 1739–1791; discussion, January, 1918, pp. 101–102. Trans., vol. 57, 1918, pp. 914–966; discussion, pp. 966–967. Discusses geographic distribution of petroleum in South America, geologic conditions, and the quality of the oil. Gives data on the distribution, geological conditions, quality, and production (statistics) in Peru, Argentina, Venezuela, Colombia, Ecuador. Brazil, Chile, Bolivia, the Guianas, and the Falkland Islands.

See also Nos. 1, 43, 44.

Geology and origin, *see* No. 306; Properties and their determination, *see* No. 306.

STATISTICS.

307. United States Geological Survey. Mineral Resources of the United States, part 2, Nonmetals, pp. 679–886. Annual production figures for the principal producing countries.

See also No. 306.

ARGENTINA (121).

HISTORICAL REFERENCES AND GEOGRAPHIC OCCURRENCE.

308. Chatfield, Lyman. Concerning oil fields of Argentina. Oil and Gas Jour., vol. 15, Mar. 1, 1917, p. 26. General conditions in the Argentine fields, and reasons for the failure of the Government in its development of the deposits in the Comodoro Rivadavia field. Description of the slight and scattered attempts made by natives and ranchmen to develop the rich oil fields of the Salta district, and discussion of opportunities for private capital in Argentine Republic.

309. Hermitte, E. M. Área de distribución de los yacimientos petrolíferos y estado actual de su explotación en la Argentina. (The location of the petroleum fields, and the status of their exploitation in Argentine.) Proc. Second Pan American Scientific Congress, 1915–16 (Washington, 1917), vol. 8, Mining, Metallurgy, Economic Geology, and Applied Chemistry, pp. 114–129. Describes occurrence and development in four districts of Argentine, gives production figures, and analyses of the oils. Contains short bibliography.

310. Oil and Gas Journal. Great future for Argentine oil fields. Vol. 16, July 5, 1917, p. 34. A translation of a review of the Argentine industry appearing in "La Nacion," of Buenos Aires, for Apr. 14, 1917, which describes the location of the fields, the quality of the oil, and possibilities of production by thorough exploitation. Also Petroleum Age, vol. 4, August, 1917, pp. 33–34.

See also Nos. 43, 44, 306.

GEOLOGY AND ORIGIN.

311. LONGOBARDI, E. Petroleum of Tres Puentes, Punta Arenas. Anales soc. quim. Argentina, vol. 5, 1917, p. 60–61. Chem. Abs., vol. 12, Jan. 10, 1918, p. 93 (Abstract). Gives mode of occurrence and properties of oil.

See also No. 306.

PROPERTIES AND THEIR DETERMINATION, *see* Nos. 366, 309, 311; STATISTICS, *see* Nos. 396, 307, 309.

PERU (122).

OCCURRENCE, *see* Nos. 43, 44, 306; GEOLOGY AND ORIGIN, *see* Nos. 306, 314; PROPERTIES AND THEIR DETERMINATION, *see* No. 306.

STATISTICS.

FIELD DEVELOPMENT AND PRODUCTION.

312. PERU. Cuerpo de Ingenieros de Minas. Boletins. Contain statistics of oil production, drilling, etc.

See also Nos. 306, 307.

OTHER COUNTRIES (129).

ECUADOR.

HISTORICAL REFERENCES AND GEOGRAPHIC OCCURRENCE.

313. ANDRADE, C. D. Outline of the petroleum resources of Ecuador. Proc. Second Pan American Scientific Congress, 1915–16 (Washington, 1917), vol. 3, Conservation of Natural Resources, pp. 203–205; discussion, pp. 205–206. Gives location of the oil fields, geology of the Santa Elena Peninsula, history of development, analysis of the oil, and a review of the advantages of the field as an oil-producing center.

314. MADDOCK, CHARLES. The oil lands of Santa Elena, Ecuador. Petroleum Rev., vol. 36, Feb. 17, 1917, p. 125. Short description of the field, the characteristics of the oil produced, and a comparison of the geology of this field with that of Peruvian productive areas.

See also Nos. 43, 44, 306.

GEOLOGY AND ORIGIN, *see* Nos. 306, 313, 314; DEVELOPMENT AND PRODUCTION, *see* No. 313; PROPERTIES AND THEIR DETERMINATION, *see* Nos. 306, 313, 314.

COLOMBIA.

GEOLOGY AND ORIGIN.

315. WHITE, K. D. Oil development in Colombia, South America. Bull. Southwestern Assoc. Petroleum Geologists, vol. 1, 1917, pp. 156–159. Gives history of attempted developments, and describes possible petroleum lands.

See also No. 306.

VENEZUELA.

STATISTICS.

316. UNITED STATES GEOLOGICAL SURVEY. Mineral Resources of the United States, 1916, part 2, Nonmetals. Gives annual exports of asphalt from Venezuela.

See also No. 306.

EUROPE (130).

GEOLOGY AND ORIGIN.

317. VAN DER GRACHT, W. The saline domes of northwestern Europe. Bull. Southwestern Assoc. Petroleum Geologists, vol. 1, 1917. pp. 85–92. Describes these formations, and discusses their probable causes and relation to oil and gas accumulation, with a view to explaining the formation of similar domes in other parts of the world, such as the Gulf Coastal Plain of the United States. Includes a brief description of the oil-producing domes of Roumania.

See also No. 284.

STATISTICS.

PRODUCTION.

318. UNITED STATES GEOLOGICAL SURVEY. Mineral Resources of the United States, part 2, Nonmetals. Annual statistics for principal producing countries.

AUSTRIA-HUNGARY (131).

OCCURRENCE (*see* Nos. 43, 44).

DEVELOPMENT AND PRODUCTION.

319. MILLAR, A. Some notes on natural gas and its utilization. Petroleum World, vol. 14, April, 1917, pp. 161–167. Discusses the collection and use of natural gas, particularly in the Galician oil fields, where it is used as fuel.

320. PETROLEUM WORLD. The petroleum industry in Austria-Hungary. Vol. 14. December, 1917, pp. 530–531. Résumé of an article by Van H. de Wit in a Dutch trade report. Explains royalty methods in use, and the participation of foreign capital in the Galician oil industry.

PROPERTIES AND THEIR DETERMINATION, *see* No. 181; UTILIZATION, *see* No. 319; STATISTICS, *see* No. 318.

GERMANY (133).

GEOLOGY AND ORIGIN, *see* No. 317.

TRANSPORTATION.

321. HENRY J. D. The Germans in oil. Why and where they have failed. Petroleum, vol 3, August, 1917, pp. 87–88, 90. Reviews Germany's achievements in the oil industry, particularly her interest in the marine transport of oil.

REFINING AND REFINERIES.

322. STEUART, D. R. The brown coal distillation industry of Germany. Jour. Soc. Chem. Ind., vol. 36, Feb. 28, 1917, pp. 167–176. Detailed description of the industry as carried on in Saxony and Messel. Makes comparisons with the Scotch oil-shale industry.

STATISTICS, *see* Nos. 318, 321.

GREAT BRITAIN (134).

HISTORICAL REFERENCES AND GEOGRAPHIC OCCURRENCE.

323. Bevan, T. H. Scotland's oil shale industry. Mining American, vol. 75. Dec. 22, 1917, p. 9. General review of the industry. From Commerce Report.

324. Engineer. The mineral oil resources of the British Empire. Vol. 124, Nov. 9, 1917, p. 412. Abstract of paper by J. S. S. Brame read before the London School of Economics. Gives statistics of the proportion of the world's output credited to the British Empire. Reviews sources of oil and discusses future prospects, particularly the possibilities of the Kimmeridge shales of England.

325. ——— The Scottish shale-oil industry. Vol. 123, Mar. 9, 1917, pp. 221–222; Mar. 23, pp. 274–275. First part gives a general review of the industry, and the second part detailed descriptions of methods of distillation, the products obtained, and their uses.

326. Forbes-Leslie, William. The occurrence of petroleum in England. Jour. Inst. Petroleum Technologists, vol. 3, February, 1917, pp. 152–183; discussion, pp. 183–190, Petroleum Rev., vol. 36, Jan. 20, 1917, pp. 45–46: Jan. 27, pp. 67–68; Feb. 3, pp. 95–96; Feb. 10, pp. 115–116; Feb. 17, pp. 137–139; Feb. 24, pp. 157–159; Mar. 3, pp. 173–174. Reviews the history of the discovery and partial development of commercially valuable oil in Great Britain, and gives locations of "oil escapes" in the middle, western, and eastern zones. Discusses the prospects of detecting further deposits through a study of those already known. Goes into a detailed study of the tectonic lines of Great Britain, and their relation to surface indications of petroleum.

327. Henry, J. D. The British Empire and the greater oil world. Petroleum, vol. 2, March, 1917, pp. 81–84; April, pp. 82–84; vol. 3, May. 1917, pp. 87–88, 90; June, pp. 87–89; July, pp. 88, 90–92, 95–96. Series of articles dealing historically and descriptively with the oil fields of the Empire. Part 1 discusses the probable exhaustion of the world's supply of oil. Part 2 describes the Trinidad oil fields. Part 3 gives the early history of asphalt, and a description of the pitch lake in Trinidad. Part 4 gives the history of the industry in Newfoundland, and part 5 gives an account of what has been done there in recent years, with a short geological description of the field.

See also Nos. 43, 44.

GEOLOGY AND ORIGIN.

328. Conacher, H. R. J. Oil shales and torbanites. Geol. Mag., decade 6, vol. 4, No. 2, February, 1917, pp. 93–94. Abstract of paper in Trans. Geol. Soc. Glasgow, vol. 16, part 2, pp. 164–192. Gives results of a microscopic study of the shales and torbanites of the Lothians to ascertain the substances which yield, on distillation, olefins, paraffins, and naphthenes in large proportions, while coal under similar treatment yields only tar containing small proportions of these compounds. Concludes that oil shales and torbanites are derived from the same substances as coal—vegetable matter—but that in the shales there has been a much more complete elimination of the woody matter, leaving the resins, cellulose, and mud.

329. DALTON, W. H. The oil prospects of the British Isles. Jour. Inst. Petroleum Technologists, vol. 4, December, 1917, pp. 37–50; discussion, pp. 51–62. Petroleum Rev., vol. 37, Nov. 24, 1917, pp. 325–326; Dec. 1, pp. 347–348. Petroleum World, vol. 14, December, 1917, pp. 521–525. Describes known occurrences in geologic sequence; concludes that prospects are not good for commercial quantities of oil, and drilling alone can decide the question definitely.

330. FERGUSON, DAVID. The form and structure of the coal fields of Scotland. Trans. Inst. Min. Eng., vol. 52, 1916–17, pp. 355–391; discussion, vol. 53, 1916–17, pp. 116–119, 167–181, 258–261. Includes discussion of the relation of oil shales to coal seams.

See also No. 6.

DEVELOPMENT AND PRODUCTION.

331. BROWN, J. L. Oil shale industry of Scotland. Coal Age, vol. 12, Sept. 8, 1917, p. 401. Brief account of mining methods and general conditions in the Scotch shale industry.

REFINING AND REFINERIES. *see* Nos. 6, 322.

STATISTICS.

IMPORTS INTO THE UNITED KINGDOM.

332. GREAT BRITAIN, HOME OFFICE, Mines and Quarries. General Report, with statistics, for 1916 (annual), by chief inspector of mines; part 3, Output.

333. PETROLEUM REVIEW. Weekly review of imports, by countries. January–December, 1917.

PRODUCTION OF PETROLEUM.

334. GREAT BRITAIN, HOME OFFICE, Mines and Quarries. General Report, with statistics, for 1916 (annual), by chief inspector of mines; part 4, Colonial and foreign statistics. Gives production statistics for all British colonies.

See also No. 324.

PRODUCTION OF SHALE IN SCOTLAND.

335. GREAT BRITAIN, HOME OFFICE, Mines and Quarries. General Report, with statistics, for 1916 (annual), by chief inspector of mines; part 3, Output. Gives statistics of oil-shale industry in Scotland.

LEGAL REGULATIONS.

336. PETROLEUM REVIEW. Developing the petroleum deposits of the United Kingdom. Vol. 37, Aug. 25, 1917, pp. 117–118. Gives text of the Government bill, introduced Aug. 15, 1917, to "make provision with respect to the searching and boring for and the getting of petroleum in the United Kingdom, and for purposes connected therewith." Government control is secured and private enterprise favored at the same time. See also Petroleum World, vol. 14, September, 1917, pp. 398–400.

ROUMANIA (136).

HISTORICAL REFERENCES AND GEOGRAPHIC OCCURRENCE.

337. BAKER, BENJAMIN. The Russian and Roumanian oil fields. Evening Post Oil Industry Supplement, New York, Aug. 31, 1917, pp. 18–20. Review of the oil resources of Russia and Roumania. Emphasizes the points of inefficiency, and present needs of the Russian industry, such as adequate transportation facilities, capital, materials, labor, and new methods of management.

338. **Negulescu, Gogu.** Petroleum industry in Roumania. Oil Trade Jour., vol. 8, April, 1917, p. 104. Brief history of the industry in Roumania, and explanation of how the land is procured for development.

339. **Vichniak, J.** L'industrie du pétrole en Roumanie. (The petroleum industry in Roumania.) Génie Civil, t. 70, Jan. 13, 1917, pp. 30–33. Gives location of fields, methods of production, production and export statistics, and the status of the different operating companies.

See also Nos. 43, 44.

Geology and origin, *see* No. 317.

DEVELOPMENT AND PRODUCTION.

340. **Oil, Paint and Drug Reporter.** Bringing back the Roumanian oil field after British "demolition." Vol. 92, Aug. 27, 1917, p. 16. Tells how the Germans took paraffin impressions of obstructions in the wells in order to make fishing tools suitable for grasping them.

341. **Petroleum Review.** The destruction of the Roumanian oil fields. Vol. 37, Sept. 15, 1917, pp. 165–167; Sept. 22, pp. 181–183. An official detailed account of how the properties of the Roumanian Consolidated Oilfields (Ltd.), were destroyed to prevent their falling into the enemy's hands.

See also Nos. 338, 339.

Statistics, *see* Nos. 318, 339.

RUSSIA (137).

HISTORICAL REFERENCES AND GEOGRAPHIC OCCURRENCE.

342. **Gubkin, I.** Petroleum in Russia. Petroleum Rev., vol. 36, May 19, 1916, p. 347; May 26, p. 363; June 2, pp. 383–384; June 16, p. 414; June 23. p. 433; vol. 37, July 7, 1917, p. 7. Translation of a Russian article. Deals with the history of the Russian industry in general, and of the Baku development in particular, with the present situation, and discusses the proper exploitation of the petroleum wealth of Russia in the future.

343. **Scientific American Supplement.** The oil fields of the Apsheron Peninsula. Vol. 84, Aug. 25, 1917, pp. 127–128. Gives history of petroleum on the peninsula, location of the oil fields, character, and geologic concurrence of the oil, description of surface indications to be found; and tells of the use of natural gas by peasants for burning lime.

See also Nos. 43. 44, 337.

GEOLOGY AND ORIGIN.

344. **Apresov, S.** Petroleum on the Apsheron Peninsula. Petroleum Rev., vol. 36, Apr. 14, 1917, p. 267; Apr. 21, p. 283; Apr. 28, p. 299. Translation of an article in Neftannoie Dielo on this subject. The first part deals with the relation between petroleum deposits and formations of folds, and the second part with the origin of petroleum in this locality.

345. **Petroleum Review.** Geological investigations of new petroliferous areas in Russia. Vol. 36, May 5, 1917, p. 313. Extract from the report of the Russian geological committee, which recommends for exploitation certain areas on the Apsheron Peninsula.

346. ——— The Terski petroleum deposits. Vol. 37, Oct. 6, 1917, p. 215. Translated from Neftannoie Dielo. Describes formation and indications of petroleum deposits in this Province.

347. **Rutkovsky, A.** The Aktchagil watery strata at Bebe-Eibat. Petroleum Rev., vol. 36, Feb. 10, 1917, p. 107. Brief description of conditions in this region as an aid to future boring.

See also No. 343.

DEVELOPMENT AND PRODUCTION.

348. **Gogava, —.** Hand-dug production of petroleum in Russia. Petroleum Rev., vol. 36, May 12, 1917, p. 331; June 16, p. 419. Gives arguments against the prohibition of hand-dug production as planned by the technical committee of the former Russian Government.

349. **Petroleum Review.** The hand-dug petroleum wells in Russia. Vol. 36, Jan. 20, 1917, pp. 47–48; Jan. 27, p. 69. Gives arguments why hand-dug wells should not be discouraged, as reported to the Russian technical petroleum control committee.

Properties and their determination, *see* Nos. 9, 343.

UTILIZATION.

350. **Petroleum Review.** Fuel consumption on the Russian railways. Vol. 36, Apr. 14, 1917, p. 265. Gives figures showing the consumption of coal, wood, and petroleum, 1904–1913, 1915 and 1916.

See also No. 343.

STATISTICS.

Prices.

351. **Petroleum Review.** Home and foreign market intelligence gives weekly report of prices. January–December, 1917.

See also Nos. 318, 350.

TURKEY (138).

Occurrence, *see* Nos. 43, 44.

OTHER COUNTRIES (139).

FRANCE.

Refining and refineries, *see* No. 832.

UTILIZATION.

352. **Génie Civil.** L'emploi de l'alcool industrial et des hydrocarbures comme carburants. (The use of industrial alcohol and hydrocarbons in carburetors.) T. 71, Oct. 6, 1917, pp. 225–228. Résumé of part of an official report on the liquid fuel resources of France, including alcohol, mixtures of alcohol, ether, etc., and petroleum, natural gas, and oil shales.

ITALY.

GEOGRAPHIC OCCURRENCE.

353. **Petroleum World.** The petroleum industry of Italy. Vol. 14, December, 1917, p. 556. Gives production and import figures, and names localities where oil indications have been found.

See also Nos. 43, 44.

PROPERTIES AND THEIR DETERMINATION.

354. RODANO, A. G. Petroleum of Neviano de' Rossi. Annali Chim. Appl., vol. 8, 1917, pp. 11–12. Chem. Abs., vol. 11, Dec. 10, 1917, pp. 3424–3425. Gives properties, distillation test, etc.

REFINING AND REFINERIES.

355. RODANO, A. G. Utilization of Italian products (petroleum and tar oils) in the preparation of benzol. Annali Chim. Appl., vol. 8, 1917, pp. 7–11; Jour. Soc. Chem. Ind., vol. 36, Oct. 31, 1917, p. 1091. Tells of experiments which showed the possibility of the use, by the cracking process, of crude petroleum from Ripi, Italy, and of mixtures of this petroleum with tar oil for the production of benzol.

STATISTICS.

PRODUCTION OF PETROLEUM AND ASPHALT.

356. REVISTA DEL SERVIZIO MINERARIO. Gives annual statistics for Italy.

See also No. 318.

SWITZERLAND.

DEVELOPMENT AND PRODUCTION.

356a. RÜST, ERNST. (The asphalt mine in the Val de Travers.) Schweiz. Chem. Ztg., Jahrg. 1, 1917, pp. 49–51; Chem. Zentr., 1918, II, p. 145; Chem. Abs., vol. 13, Nov. 29, 1919, p. 2836. Describes occurrence and recovery of the asphalt

ASIA (140).

STATISTICS.

PRODUCTION OF PETROLEUM, NATURAL GAS AND ASPHALT.

357. UNITED STATES GEOLOGICAL SURVEY. Mineral Resources of the United States, 1916, part 2, Nonmetals. Annual statistics for principal producing countries.

CHINA (141).

OCCURRENCE, *see* Nos. 43, 44.

GEOLOGY.

358. WANG, CHUNG YU. Bibliography of the mineral wealth and geology of China from 1912 to 1917. Shanghai, The Commercial Press (Ltd.), 1917. 21 pp. A continuation of the author's work on the same subject published in 1912. Includes references on petroleum in China.

DEVELOPMENT AND PRODUCTION.

359. KERN, C. E. China has oil possibilities. Oil and Gas Jour., vol. 15, Feb. 1, 1917, pp. 31–32. Reports interview with the Chinese minister to the United States, in which the commercial opportunities in oil are discussed and a history of past field operations given.

360. RICHARDSON, H. K. The production of salt in Szechuen Province, western China. Met. and Chem. Eng., vol. 16, Jan. 1, 1917, pp. 32–40; vol. 17, Sept. 1, 1917, pp. 225–226; Sept. 15, pp. 313–316. Description of the methods used to obtain salt from wells which often produce large quantities of gas, which is used in burners for evaporating the salt.

INDIA (142).

OCCURRENCE, *see* Nos. 43, 44.

GEOLOGY.

360a. LA TOUCHE, T. H. D. A bibliography of Indian geology and physical geography, with an annotated index of minerals of economic value. Published by order of the government of India and printed in Calcutta for the Geological Survey of India. Part I, 1917. 571 pp. Part II, 1918. 490 pp.

DEVELOPMENT AND PRODUCTION.

361. JACK, H. S. M. The development of the petroleum industry in Assam. Jour. Inst. Petroleum Technologists, vol. 3, June, 1917, pp. 263–276; discussion, pp. 276–286. Petroleum Rev., vol. 36, Apr. 21, 1917, pp. 287–288; Apr. 28, pp. 303–304. Gives brief general description of the country, history of early prospecting, and attempted development. Explains difficulties in obtaining geological data and in drilling, and describes drilling methods used. Gives properties of the oil and its refined products.

PROPERTIES AND THEIR DETERMINATION, *see* No. 361.

STATISTICS.

General Review.

362. **Petroleum World.** Petroleum in Burma, 1916. Vol. 14, October, 1917, pp. 448, 450. Reviews developments of the year, by fields, giving statistics of production for the years 1905–1916.

Imports.

363. **India Geological Survey Records.** Gives annual statistics of petroleum imports.

Production of Petroleum.

364. **Great Britain, Home Office.** Mines and Quarries: General Report, with statistics (annual), by chief inspector of mines. Part 4, Colonial and foreign statistics.

See also No. 357.

JAPAN (143).

Occurrence, *see* Nos. 43, 44.

DEVELOPMENT AND PRODUCTION.

365. **Compressed Air Magazine.** Hand-dug oil wells in Japan. Vol. 22, October, 1917, pp. 8525–8527. Describes primitive methods used in Higashiyama.

366. **Oil Age.** Hand-dug wells in Higashiyama. Vol. 13, July, 1917, p. 22. Quoted from the Petroleum News, of Tokyo. Describes primitive method of diggings wells in close proximity to the modern method of operation in the same field. *See also* Petroleum Rev., vol. 37, Sept. 1, 1917, p. 135.

Statistics, *see* No. 357.

OTHER COUNTRIES (149).

PERSIA.

HISTORICAL REFERENCES AND GEOGRAPHIC OCCURENCE.

367. **Mining and Oil Bulletin.** Petroleum development in Persia. Vol. 3, September, 1917, p. 298. Brief history, present developments, and future prospects.

See also Nos. 43, 44.

AFRICA (150).

OCCURRENCE, *see* Nos. 43, 44.

GEOLOGY AND ORIGIN.

367a. DU TOIT, A. L. Notes on the Karroo system in southern Kalahari. Trans. Geol. Soc. South Africa, vol. 19, Jan.–Dec., 1916 (published 1917), pp. 1–13.

367b. ——— Report on the prospects of finding oil in the southern Karroo. Mem. 8, Geol. Survey, Union of South Africa.

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368a. MACGREGOR, A. M. The Karroo rocks and later sediments northwest of Bulawayo. Trans. Geol. Soc. South Africa, vol. 19, Jan.–Dec., 1916 (published 1917), pp. 14–32.

368b. SCHWARZ, E. H. L. Notes on the geology of Natal. Trans. Geol. Soc. South Africa, vol. 19, Jan.–Dec., 1916 (published 1917), pp. 46–53. Describes carbonaceous shales.

369. WAGNER, P. A. Mineral oil, solid bitumen, natural gas, and oil shales. South African Jour. Ind., vol. 1, October, 1917, p. 126.

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370. UNITED STATES GEOLOGICAL SURVEY. Mineral Resources, part 2. Nonmetals. Annual production figures for Egypt.

OCEANIA AND MALAYSIA (160).

STATISTICS.

PRODUCTION OF PETROLEUM AND ASPHALT.

371. UNITED STATES GEOLOGICAL SURVEY. Mineral Resources, part 2, Nonmetals. Annual production statistics for principal producing countries.

AUSTRALIA (161).

GEOLOGY AND ORIGIN.

372. PETROLEUM WORLD. Oil drilling in South Australia. Vol. 14, January, 1917, pp. 8–10; March, pp. 120–121. Favors possibilities of production in this region, as supported by Dr. Basedow, and refuting the published opinions of Dr. Wade. Gives actual results of a bore.

373. ——— Hopes dashed in Australia. Vol. 14, May, 1917, pp. 228, 230. Summary of adverse report by the Government geologist of South Australia on the prospects of finding oil there.

374. ——— South Australian oil wells. Vol. 14, March, 1917, p. 116. Tells of satisfactory developments in South Australia and further proofs of the presence of oil there.

UTILIZATION.

375. AUTOMOBILE AND AUTOMOTIVE INDUSTRIES. Australia wants alcohol fuel. Vol. 37, Oct. 18, 1917, pp. 669–670. Quotes from "Autocar," the report of the committee of the Australian Commonwealth Advisory Council of Science and Industry on alcohol fuel. Considers the subject under the following heads: The design and manufacture of the engine; the supply of the alcohol, including its distribution; the denaturation of the alcohol. (See also Engineer, vol. 124, Sept. 28, 1917, pp. 278–279.)

376. PETROLEUM WORLD. Motor fuel from sugar and wheat. Vol. 14, March, 1917, pp. 127–130. Suggested schemes for gasoline substitutes in Australia.

See also No. 1386.

STATISTICS, *see* No. 371.

BORNEO, JAVA, AND SUMATRA (162).

OCCURRENCE, *see* NOS. 43, 44; STATISTICS, *see* No. 371.

NEW GUINEA (163).

GEOLOGY AND ORIGIN.

377. PARK, W. E. Australian Government is seeking oil. Oil and Gas Jour., vol. 15, Mar. 22, 1917, p. 32. Tells of geological investigations in New Guinea, and of localities in which conditions are favorable for supplying petroleum and in which oil indications actually exist.

STATISTICS, *see* No. 371.

NEW ZEALAND (164).

STATISTICS, *see* No. 371.

PHILIPPINE ISLANDS (165).

OCCURRENCE, *see* Nos. 43, 44.

STATISTICS.

IMPORTS OF PETROLEUM.

378. UNITED STATES BUREAU OF FOREIGN AND DOMESTIC COMMERCE. Monthly summary of foreign commerce of the United States gives quantity and value of crude and refined mineral oils exported to the Philippines.

GEOLOGY AND ORIGIN (200).

GENERAL AND MISCELLANEOUS GEOLOGY (210).

379. Clapp, F. G. Ethics of the petroleum geologist. Econ. Geol., vol. 12, February–March, 1917, pp. 105–137. Abstract, Bull. Geol. Soc. Am., vol. 28, March, 1917, p. 157. Paper read before the Geological Society of America, December, 1916. Reviews literature on professional ethics, and outlines an ethical code for consulting petroleum geologists, covering the geologist and his client, his assistants, and the community. Gives a reference list of papers on Engineering Ethics.

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381. Kite, W. C. An outline for a type report on an oil field. Bull. Southwestern Assoc. Petroleum Geologists, vol. 1, 1917, pp. 131–133. Suggests the following main headings: Location of area; physiography; stratigraphy; structure; surface indications; development; summary.

382. Mayer, W. P. Popular oil geology. Chicago, 1917. 15 pp. Published by the author.

See also No. 193.

GEOLOGIC STRUCTURE (240).

383. Clapp, F. G. Revision of the structural classification of petroleum and natural gas fields. Bull. Geol. Soc. Am., vol. 28, September, 1917, pp. 553–602. Abstract, Bull. Geol. Soc. Am., March, 1917, p. 158. Suggests further subdivision and additions to the classification proposed in a paper by the author, "A proposed classification of petroleum and natural gas fields based on structure," Econ. Geol., vol. 5, September, 1910, pp. 503–521.

384. Fohs, F. J. How a structure contour map is made. Oil and Gas Jour., vol. 15, Jan. 18, 1917, p. 54. Paper read before the Oklahoma Society of Engineers that gives a map of an ideal dome, with brief explanations.

See also Nos. 105, 127.

ORIGIN (250).

385. Guareschi, Icilio. Petrolii ed emanazioni terrestri. (Petroleum and terrestrial emanations.) Torino: Unione Tipografico-Editrice Torinese, 1917. Presents a lengthy discussion of the origin of petroleum, evolution of modern theories and the composition of gaseous emanations, with special reference to the genesis of petroleum, asphalt, and bitumens.

386. **Haldeman, J. A.** New theory of petroleum formation. Nat. Petroleum News, vol. 9, October, 1917, pp. 22, 24, 24–B, 24–D, 24–F. An explanation of the theory that heat and pressure from changes in the earth's equilibrium cause the formation of oil deposits. Also in Petroleum Age, vol. 4, November, 1917, pp. 37–40.

See also Nos. 216, 1041.

ORGANIC THEORIES.

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388. **White, David.** Late theories regarding the origin of oil. Bull. Geol. Soc. Am., vol. 28, September, 1917, pp. 727–734. Reviews earlier theories and discusses the modern organic theory. Discusses distillation versus bacterial origin in the working out of the organic theory, the influence of chemical processes, and the effects of progressive regional alteration. Considers briefly the undeveloped hypothesis of Richardson regarding phenomena of surfaces and films. (See Richardson, Clifford. The origin of petroleum and asphalt. Jour. Ind. and Eng. Chem., vol. 8, January, 1916, p. 4.)

See also Nos. 6, 635.

ACCUMULATION (260).

389. **Daly, M. R.** The diastrophic theory. A contribution to the study of the mechanics of oil and gas accumulation in commercial deposits. Trans. Am. Inst. Min. Eng., vol. 56, 1917, pp. 733–753; discussion, pp. 753–781. Published also in Bull. Am. Inst. Min. Eng., July, 1916, pp. 1137–1157; discussion, Dec., 1916, pp. 2204–2211; May, 1917, pp. 871–891. Sets forth a new interpretation of rock pressure and of the sealing up of such pressure in oil and gas pools. Discusses the theory that accumulation depends directly on diastrophic deformations.

390. ——— Geosynclines and petroliferous deposits. Bull. Am. Inst. Min. Eng., August, 1917, pp. 1135–1146; discussion January, 1918, pp. 97–99. Trans., vol. 57, 1918, pp. 1054–1065; discussion, pp. 1065–1070. "A contribution to the study of the relations between earth movements and hydrocarbon accumulations."

391. **Lauer, A. W.** The petorology of reservoir rocks and its influence on the accumulation of petroleum. Econ. Geol., vol. 12, August, 1917, pp. 435–472. Discussion, by J. O. Lewis, Econ. Geol., vol. 13, January, 1918, pp. 65–69; by W. F. Jones, Econ. Geol., vol. 13, March, 1918, pp. 147–149; by E. W Shaw, Econ. Geol., vol. 13, May, 1918, pp. 207–222; and by G. S. Rogers, Econ. Geol., vol. 13, June, 1918, pp 316–324. A study of rock openings and the part played by them in the migration of petroleum, consisting of a general study of the causes of openings of all kinds and sizes, and a detailed examination of specimens of oil-bearing rock from

wells in the different oil fields of the United States and Mexico. Concludes that induced porosity is usually much more important in oil accumulation than original interstitial porosity; that hydrostatic water action is an important factor in accumulation; and that the anticlinal theory is re-established.

392. McCoy, A. W. Some effects of capillarity on oil accumulation. Bull. Southwestern Assoc. Petroleum Geologists, vol. 1, 1917, pp. 140–147. Points out the possibility that capillary forces have caused anticlines in nature. (Appeared also in Jour. Geol., vol. 24, November–December, 1916, p. 798–805; discussion, vol. 25, September–October, 1917, pp. 584–586.)

See also No. 396.

393. Petroleum Review. Migrations and accumulations of petroleum. Vol. 37, November 10, 1917, pp. 293–294; Nov. 17, pp. 315–316; Nov. 24, pp. 331–332. Translation of article in the Journal du Pétrole. Deals with the conditions and forces which cause the migration of petroleum through geologic strata, and the circumstances which cause its accumulation in so-called petroleum deposits.

394. Shaw, E. W. Intermolecular attractions and oil and gas accumulation. Paper read before the Geological Society of America. (Abstract.) Bull. Geol. Soc. Am., vol. 28, March, 1917, p. 158. Discusses the age of widely known peneplains of the Appalachian province, concluding that they are younger than the latest date yet assigned.

395. ——— Surface tension, capillarity, and petroleum pools. Science, new series, vol. 45, May 25, 1917, pp. 500–501. Discusses the part that capillarity or differences in intermolecular attraction may play in oil and gas accumulation.

396. Washburne, C. W. "Some effects of capillarity on oil accumulation," by A. W. McCoy. Jour. Geol., vol. 25, September–October, 1917, pp. 584–586. Discussion of the above paper. (See No. 392.) Gives reasons why the main argument of the paper—that capillary action may possibly lift strata into anticlines—is impossible.

397. White, I. C. The anticlinal theory. Proc. Am. Min. Congress, vol. 19, 1916 (published 1917), pp. 550–556. Recounts the author's discovery of this theory, and its demonstration in practice.

See also Nos. 240, 317, 399.

APPLIED GEOLOGY (270).

398. Allen, M. A. Prospecting for petroleum. Univ. Arizona Bull. 69, Oil Series No. 2, November, 1917. 18 pp. Explains usual modes of occurrence of petroleum, natural gas, and the solid bitumens; indicates the usual surface and underground indications of their presence to be studied by the prospector. Discusses the application of geology in finding oil.

DETERMINATION OF OIL AND GAS FIELDS.

399. McDowell, J. C. Geology in its relation to the oil industry. Proc. Am. Mining Congress, vol. 19, 1916 (published 1917), pp. 284–302. Emphasizes the importance of applied geology, particularly the anticlinal theory, in locating oil and gas fields. Gives examples of successful development, through geologic study, in three recent Kansas pools. The geology and structure of the Augusta pool are described in detail.

400. Smith, G. O. Topographic map necessary in scientific search for oil. Mining Congress Jour., vol. 3, February, 1917, p. 55. Tells of the desirability, in making geologic examinations, of having an accurate topographic base map on a scale of an inch or more to the mile, on which the altitudes above sea level have been accurately registered.

401. Thomas, J. E. The value of geology in producing petroleum. Evening Post Oil Industry Supplement, New York, Aug. 31, 1917, pp. 14–16. Outlines the work of geologists in locating prospective oil fields, in locating and drilling test wells, in developing fields, in appraising and setting valuations, and in estimating total yields.

402. Woodruff, E. G. The geologist in the oil business. Texaco Star, vol. 4, February, 1917, pp. 6–13. Explains the rôle of the geologist in locating and developing oil pools.

403. Ziegler, Victor. Rôle of geology in petroleum discovery. Colorado School of Mines Mag., vol. 7, October, 1917, pp. 171–172. From the Denver Times, Sept. 28, 1917. Discusses the work of the geologist in determining rock structure, and in locating favorable areas.

See also Nos. 140, 160, 211, 212.

DEVEOLPMENT AND PRODUCTION (300).

GENERAL.

404. Manning, V. H. Seventh annual report by the Director of the Bureau of Mines to the Secretary of the Interior, for the fiscal year ended June 30, 1917. Washington, 1917. 106 pp. Contains (pp. 71–79) an account of the investigations during the year by the petroleum division of the bureau.

405. ——— Yearbook of the Bureau of Mines, 1916. Bull. 141, Bureau of Mines, 1917. 174 pp. Describes the more important work of the bureau during 1916, including (pp. 116–133) the investigations by the petroleum division of drilling, production, and conservation, transportation, storage, and refining. Tells also (pp. 49–50) of the supervision of drilling for oil and gas on segregated coal lands and on Indian lands, and of investigations (pp. 92–93) of processes for recovering gasoline from natural gas.

DRILLING (METHODS, TOOLS, AND EQUIPMENT) (310).

DRILLING METHODS.

406. Burton, G. E. Methods of exploring for oil and gas. Oklahoma Geol. Survey Circular 8, 1917. 20 pp. Includes costs of drilling oil and gas wells.

See also Nos. 81, 340, 405, 1041.

PERCUSSION.

407. Kobbé, W. H. Problems connected with the recovery of petroleum from unconsolidated sands. Trans. Am. Inst. Min. Eng., vol. 56, 1917, pp. 799–822; discussion, pp. 823–830. Published also in Bull. Am. Inst. Min. Eng., December, 1916, pp. 2253–2267; discussion, March, 1917, pp. 385–389; April, 1917, pp. 621–622; June, 1917, pp. 983–985.

408. Millar, Arthur. The Canadian drilling system. The preparation of the derrick and the arrangement of the machinery; description of the tools, other appliances, and of method used in drilling; the actual operation of drilling: some difficulties and problems; steel v. wood derricks; advantages and disadvantages of the two types. Petroleum World, vol. 14, June, 1917, pp. 250–255; July, pp. 305–308, 310; August, pp. 344–346; September, pp. 389–395; October, p. 444; December, pp. 532–533.

PATENT.

409. Greve, E. E. Casing elevator. Canadian patent 178290, July 24, 1917.

See also No. 108.

ROTARY.

410. Fletcher, H. W. Well driving with the hydraulic rotary. Sibley Jour. Eng., vol. 31, May, 1917, pp. 198–200. Brief description of rotary method, with diagrams and photographs.

411. **Straub, C. E.** Core drilling as applied to the development of possible oil producing territory. Oil Trade Jour., vol. 8, July, 1917, pp. 101–103. Discusses the advantages of the core drill as compared with the ordinary standard rig.

See also Nos. 108, 409.

DRILLING TOOLS.

PATENT.

412. **Behan, William.** Well bucket. U. S. patent 1251325, Dec. 25, 1917.

See also No. 408.

PERCUSSION.

413. **McElwaine, Eugene.** How wire cables are made and used. Oil and Gas Jour., vol. 16, July 19, 1917, pp. 35–36; July 26, pp. 34, 38. Gives information of a practical nature on the use of wire lines in oil-field work.

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415. **Bess, W. W.** Fishing tool for underreamer lugs. U. S. patent 1242129, Oct. 9, 1917.
416. **Colgan, S. P., and Frederick, Walter.** Device for recovering pipes, shafts, etc., from wells. U. S. patent 1223034, Apr. 17, 1917.
417. **Cutler, W. C.** Underreamer. U. S. patents 1225701, May 8, 1917; 1239087, Sept. 4, 1917.
418. **Freeon, H. J.** Underreaming bit. U. S. patent 1220739, Mar. 27, 1917.
419. **Keck, W. M.** Underreamer. U. S. patent 1225968, May 15, 1917.
420. **Kibele, Eugene.** Lifting clamp for well casings. U. S. patent 1231616, July 3, 1917.
421. **Kuhns, J. H.** Swivel socket for oil and gas well drills. U. S. patent 1212962, Jan. 16, 1917.
422. **Lane, G. L.** Well-drilling bit. U. S. patent 1218671, Mar. 13, 1917. Canadian patent 176420, Apr. 17, 1917. English patent 107184, Aug. 9, 1917. Application 2974, Feb. 28, 1917.
423. **Laws, W. S., and Drake, L. B.** Drill for oil wells. Canadian patent 177090, May 15, 1917.
424. **Layne, M. E.** Well-boring stem. U. S. patent 1223591, Apr. 24, 1917.
425. **McCausland, W. A.** Well drilling apparatus. U. S. patent 1211198, Jan. 2, 1917.
426. **Mills, E. L.** Underreamer. U. S. patents 1221352, 1221353, Apr. 3, 1917.
427. **Osborne, W. R.** Pipe pulling device. U. S. patent 1241430, Sept. 25, 1917.
428. **Runyan, William.** Drilling-bit socket. U. S. patent 1217349, Feb. 27, 1917.
429. **Tomsany, Joseph.** Rope guard for boring rigs. U. S. patent 1237414, Aug. 21, 1917.
430. **Wagner, Warren.** Casing spear. U. S. patent 1243904, Oct. 23, 1917.
431. **Walker, H. B.** Means for removing and disengaging well packers. U. S. patent 1214622, Feb. 6, 1917.
432. **Wigle, W. B.** Combination casing head and spider. U. S. patent 1217853, Feb. 27, 1917.

433. **Wilkins, C. A.** Device for measuring wells. U. S. patent 1251152, Dec. 25, 1917.

434. **Wilson, E. C.**, and **Wilson, W. W.** Underreamer. English patent 110189, Dec. 5, 1917. Application 14427, Oct. 11, 1916, Oct. 11, 1917.

435. **Wright, C. S.** Underreamer. U. S. patent 1242508, Oct. 9, 1917.

ROTARY.

436. **Oil Age.** New rotary roller bit. Vol. 13, October, 1917, pp. 12–14. Describes bit invented by C. E. Reed. Constructed on the revolving disk principle.

See Nos. 453, 454.

PATENTS.

437. **Bardeen, H. A.** Roller bit. U. S. patent 1238707, Aug. 28, 1917.

438. **Campbell, L. S.**, and **Grant, J.** Boring wells. English patent 102250. Application 5601, Apr. 17, 1916. Not yet accepted.

439. **Carden, D. A.** Detachable drill bit. U. S. patent 1222845, Apr. 17, 1917.

440. **Chapman, C. T.** Drill bit. U. S. patent 1228296, May 29, 1917.

441. **Chapman, M. T.** Well sinking apparatus. U. S. patent 1248614, Dec. 4, 1917.

442. **Double, Edward.** Rotary bit. U. S. patent 1224287, May 1, 1917.

443. **Gardner, L. S.** Rotary drill. U. S. patent 1238757, Sept. 4, 1917.

444. **Hensley, S. S.** Drill. U. S. patent 1225629, May 8, 1917.

445. **Hughes, H. R.** Boring earth. English patent 102920. Application 1232, Jan. 26, 1916. Not accepted.

446. ——— Deep boring. English patent 106264, July 12, 1917. Application 13139, Sept. 15, 1916.

447. ——— Rotary boring drill. U. S. patents 1231159, June 26, 1917; 1238407, Aug. 28, 1917; 1245462, Nov. 6, 1917; 1247839, Nov. 27, 1917.

448. ——— Rotary disk drill. U. S. Patent 1227911, May 29, 1917.

449. **Lincoln, H. B.** Valve means for oil well swivels. U. S. patent 1217467, Feb. 27, 1917.

450. **McNamara, Alexander.** Deep boring. English patent 106133, May 10, 1917. Application 6692, May 10, 1916.

451. **Martin, R. D.** Drill bit for wells. U. S. patent 1211331, Jan. 2, 1917.

452. **Parker, R. B.**, and **Spurlock, R. C.** Oil well drill. U. S. patent 1238563, Aug. 28, 1917.

453. **Reed, C. E.** Roller boring drill. U. S. patent 1236983, Aug. 14, 1917. Described in Oil Age, vol. 13, October, 1917, pp. 12–14. *See* No. 436.

454. ——— Well-boring drill. U. S. patent 1236982, Aug. 14, 1917. Described in Oil Age, vol. 13, October, 1917, pp. 12–14. *See* No. 436.

455. **Richard, L. L.** Rotary drilling bit. U. S. patent 1226377, May 15, 1917.

456. **Schubert, H. F.** Well-drilling tool. U. S. patent 1210704, Jan. 2, 1917.

457. **Theriot, J. C.** Safety attachment for well-drilling tools. U. S. patent 1212848, Jan. 16, 1917.

458. **Watts, H. J.** Drill. Canadian patent 178854, Aug. 21, 1917.

459. ——— Drill or boring member. U. S. patent 1241176, Sept. 25, 1917.

460. **Whittier, C. F.**, and **Whittier, M. H.** Safety rotary well-boring tool. U. S. patent 1217079, Feb. 20, 1917.

461. **Wilcox, C. E.** Well-boring apparatus. U. S. patents 1220919, Mar. 27, 1917; 1235866, Aug. 7, 1917.

See also Nos. 420, 427, 430, 431, 432.

DRILLING EQUIPMENT.

462. **Millar, Arthur.** Electrical hints for oil-well engineers. Petroleum World, vol. 14, June, 1917, pp. 266–267. Deals with electric lighting in rigs and surrounding buildings, making suggestions as to insulation, wiring, lamp fittings, and fire precautions.

See also Nos. 408, 477.

RIGS AND DERRICKS AND PARTS THEREOF.

463. **Tough, F. B.** Prevention of oil derrick failures in windstorms by improved method of guying. West Eng., vol. 8, February, 1917, pp. 63–68. Discussion of derrick failures during storms of January, 1916, in California, which resulted from faulty methods of guying. Description of methods now used, with diagrams and photographs.

464. **Woodworth, R. B.** The evolution of drilling rigs. Trans. Am. Inst. Min. Eng., vol. 54, 1917, pp. 216–281; discussion, pp. 282–288. Published first in Bull. Am. Inst. Min. Eng., November, 1915, pp. 2247–2312; discussion, May, 1916, pp. 953–959.

See also No. 408.

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465. **Griffith, Moses.** Drill rigging. U. S. patent 1251220, Dec. 25, 1917.

466. **Kightlinger, A. D.** Derrick. U. S. patent 1221747, Apr. 3, 1917.

467. **McCausland, W. A.** Well drilling machinery. U. S. patent 1211199, Jan. 2, 1917.

468. **Pollak, R. R.** Oil well rig. U. S. patent 1244240, Oct. 23, 1917.

469. **Ross, C. S.** Bull or calf wheel for well rigs. U. S. patent 1235504, July 31, 1917.

470. **Runnion, Alonzo.** Well drilling apparatus. U. S. patent 1235385, July 31, 1917.

471. **Thompson, J. V.** Oil-well drilling apparatus. U. S. patent 1225891, May 15, 1917.

472. **Wigle, W. B.** Bull and calf wheel. U. S. patent 1223303, Apr. 17, 1917.

POWER.

473. **Taylor, W. G.** The development and extent of the operation of oil wells by electric power. Gen. Elec. Rev., vol. 20, June, 1917, pp. 468–475. Reviews the introduction of the electric motor in the principal oil fields of the United States, and shows how it has become the most approved method of drive. Concludes with a short bibliography, chronologically arranged, from 1911–1916.

474. **Torchio, Philip.** Industrial applications of electricity. Proc. Second Pan American Scientific Congress, 1915–16 (Washington, 1917), vol. 6, section 5, Engineering, pp. 262–303. Includes (pp. 285–286) discussion of the drilling and pumping of oil and gas wells by electricity, with data from California practice.

CASING AND FITTINGS.

475. **Aston, James.** Wrought-iron pipe for use in natural gas field. Proc. Nat. Gas Assoc. Am., vol. 9, 1917, pp. 399–408; discussion, pp. 408–417. Nat. Gas and Gasoline Jour., vol. 11, September, 1917, pp. 246–249; discussion, pp. 249–252. Gas Age, vol. 39, June 15, 1917, pp. 631–633; discussion, pp. 633–635. Characteristics and adaptability of certain kinds of pipe in the recovery and distribution of natural gas.

476. OIL AGE. Casing head for oil wells. Vol. 13, September, 1917, pp. 12–14, 22. Detailed description of patent of D. L. Maxwell.

See No. 486.

477. PETROLEUM WORLD. The single-bail elevator. Vol. 14, June, 1917, pp. 270–271. Describes and illustrates device for rapid handling of large casing, with safety device for preventing accidents.

PATENTS.

478. BEATTY, E. T. Quick-detachable coupling for drill pipes. U. S. patent 1218359, Mar. 6, 1917.

479. BOYD, PETER, and SAUNDERS, A. M. Well casing. U. S. patent 1225005, May 8, 1917.

480. CROSS, G. C. Driven-well point and strainer, U. S. patent 1211415, Jan. 9, 1917.

481. FOSTER, W. H. Strainer. U. S. patent 1229437, June 12, 1917.

482. HANSON, H. E. Well screen. U. S. patent 1223969, Apr. 24, 1917.

483. HEGGEM, A. G. Casing head for wells. English patent 14502, Jan. 31, 1917. Application dated Oct. 13, 1915.

484. HOVIS, P. S., and CURRY, CHARLES. Joint for well casing. Canadian patent 175439, Feb. 27, 1917.

485. LEONARD, R. E. Art of well producing or earth boring. U. S. patent 1233888, July 17, 1917.

486. MAXWELL, D. L. Casing head for oil wells. U. S. patent 1228686, June 5, 1917. Canadian patent 179375, Sept. 18, 1917. Described in Oil Age, vol. 13, September, 1917, pp. 12–14, 22. *See* No. 476.

487. MILLIGAN, O. T. Oil well capping device. U. S. patent 1249167, Dec. 4, 1917.

488. NYMANNING, GEORGE. Casing shoe. U. S. patent 1223098, Apr. 17, 1917.

489. PORTER, J. K., and MORRIS, H. F. Drilling wells. (Casing shoe.) English patent 105989, June 27, 1917. Application 6572, May 8, 1916.

490. SCANLIN, JAMES. Oil-casing closing apparatus. U. S. patent 1217837, Feb. 27, 1917.

491. SUTTON, GILBERT. Thread protector for well casings. U. S. patent 1231450, June 26, 1917.

492. SWEENEY, M. L. Pipe or well casing. U. S. patent 1240098, Sept. 11, 1917.

493. TUTTLE, FRANK, and HALL, L. T. Casing shoe. U. S. patent 1246360, Nov. 13, 1917.

494. WALKER, H. B. Release joint for well casings. U. S. patent 1243364, Oct. 16, 1917.

495. WIGLE, W. B. Casing head. Canadian patent 178862, Aug. 21, 1917.

496. WILLARD, A. G. Top closure for oil-well casings. U. S. patent 1220998, Mar. 27, 1917.

See also No. 432.

PROTECTION AGAINST CORROSION.

See No. 475.

CONTROL OF WATER AND WASTE.

CEMENT.

497. BELL, H. W. Exclusion of water from oil formations. West. Eng., vol. 8, March, 1917, pp. 89–90. Cites cases of recent failures in cementing wells in California in order to illustrate the necessity for testing the cement before its application, and for exercising care generally. Describes the tamping process of shutting off water, now little used, and makes inquiry into its disappearance.

PACKERS (PATENTS).

498. **Lindsay, J. G.** Well packing. U. S. patent 1246957, Nov. 20, 1917.

499. **Mack, P. H.** Oil-well packer. U. S. patent 1248881, Dec. 4, 1917.

500. ——— Well packer, U. S. patent 1248882, Dec. 4, 1917.

MUD FLUID.

OTHER METHODS.

501. **Travers, W. J.** The tamping process of excluding water from oil wells. West. Eng., vol. 8, May, 1917, pp. 169–170. Enumerates advantages of this process as seen in actual operation.

See also No. 497.

CONTROL OF WELLS.

502. **Heggem, A. G.** The control of petroleum and natural gas wells. Trans. Am. Inst. Min. Eng., vol. 54, 1917, pp. 289–300. Published first in Bull. Am. Inst. Min. Eng., January, 1916, pp. 151–163.

See also Nos. 162, 539.

USE OF EXPLOSIVES, SHOOTING (PATENT).

503. **McAvoy, J. E.** Method of shooting oil wells. U. S. patent 1248689, Dec. 4, 1917.

RECORDS OF FORMATION, COST, ETC.

504. **Matteson, W. G.** The need and advantages of a national bureau of well-log statistics. Bull. Am. Inst. Min. Eng., February, 1917, pp. 287–290; discussion, April, 1917, pp. 635–640; May, pp. 833–834; June, pp. 986–987. Transactions, vol. 56, 1917, pp. 881–884; discussion, pp. 884–891. Using as an example the recently passed California State law providing for the inspection of oil and gas wells and for the keeping of accurate well logs, a Federal law of similar requirements is suggested as an aid to future development and to the conservation of the products.

505. ——— The practical value of oil and gas bureaus. Bull. Am. Inst. Min. Eng., June, 1917, pp. 979–981; discussion, October, pp. 1857–1862; January, 1918, pp. 75–88. Trans., vol. 57, 1918, pp. 1010–1012; discussion, pp. 1012–1033. Emphasizes the practical value of accurate well logs and of their supervision by national or State bureaus, and urges the establishment of bureaus similar to those of California and Oklahoma.

See also Nos. 81, 140, 164, 285.

PRODUCTION (METHODS, EQUIPMENT, AND OPERATIONS) (320).

See Nos. 208, 405.

PUMPING OIL WELLS.

TOOLS AND EQUIPMENT.

506. **Barnes, R. M.** Central-power and jack-pumping plants for operation of oil wells. West. Eng., vol. 8, May, 1917, pp. 177–182; June, pp. 223–227. Abstract of a thesis for the Department of Civil Engineering, University of California. A detailed description of the system based on an extensive field investigation. Considers the design and methods of construction of the different parts of the system, and gives bills of material and approximate costs.

PATENTS.

507. **Black, W. G.,** and **Segelhorst, A. L.** Deep-well pump. U. S. patent 1219799, Mar. 20, 1917.

508. **Bodinson, L. W.** Deep-well pump. U. S. patent 1230554, June 19, 1917.

509. **Easthan, J. M.** Deep-well pump. U. S. patent 1221519, Apr. 8, 1917.

510. **Fuller, K. D.** Safety device for oil pumps. U. S. patent 1242539, Oct. 9, 1917.

511. **Guiberson, S. A., Jr.** Well-tubing catcher. U. S. patent 1218549, Mar. 6. 1917.

512. **Hamlin, F. J.** Deep-well pumping cylinder. U. S. patent 1213358, Jan. 23, 1917.

513. **Holmes, R. E. L.** Double-acting deep-well pump. U. S. patent 1247113, Nov. 20, 1917.

514. **Rigby, C. F.** Sucker-rod joint. U. S. patent 1250509, Dec. 18, 1917.

515. **Risden, H. G.,** and **Seppi, Frank.** Drain device for well-pump tubing. U. S. patent 1213776, Jan. 23, 1917.

516. **Salberg, C. O.** Sucker rod for deep-well pumps. U. S. patent 1246329, Nov. 13, 1917.

517. **Sperry, J. B.** Deep-well pump. U. S. patent 1230612, June 10, 1917.

518. **Swanson, C. A.** Stuffing box for oil-well pumps. U. S. patent 1245286, Nov. 6, 1917.

POWER.

519. **Gassaway, S. G.** Comparative costs of developing power for pumping in the oil fields. Gen. Elec. Rev., vol. 20, August, 1917, pp. 652–657. Shows the economy in the use of electricity by comparison of operating data and costs with those of steam and gas power.

See also Nos. 473, 474, 506.

SPECIAL PUMPING METHOD (PATENT).

520. **Yeomans, G. R.** Method of and apparatus for extracting oil from subterranean strata. U. S. patent 1237139, Aug. 14, 1917.

CARE OF PRODUCING OIL WELLS.

CLEANING (PATENTS).

521. **Carden, D. A.** Cleaning devices for wells. U. S. patent 1230666, June 19, 1917.

522. **Deats, G. W.** Apparatus for cleaning deep wells. U. S. patents 1235294, July 31, 1917; 1235770, Aug. 7, 1917.

HEATING (PATENT).

523. **Truman, Vin,** and **Skillen, G. L.** Oil-well heater. U. S. patent 1232736, July 10, 1917.

Operation of wells producing water, *see* Nos. 116, 209, 210; Determination of source of water, *see* Nos. 53, 84.

WATER ANALYSES.

524. **Sweeney, O. R., and Withrow, J. R.** The chemical examination of natural brines. Jour. Ind. and Eng. Chem., vol. 9, July, 1917, pp. 671–675. Describes methods of analysis of natural brines, applicable to those found in oil, gas, and coal fields, to meet the needs of the manufacturing chemist.

See also Nos. 52, 53, 54, 55, 56, 66, 211, 212.

TOOLS AND EQUIPMENT (PATENTS).

525. **Gilbert, A. E.** Rod-pulling machine. U. S. patent 1249947, Dec. 11, 1917.

526. **Richard, L. L.** Sucker rod and casing elevator. U. S. patent 1219776, Mar. 20, 1917.

GAS WELLS.

See Nos. 89, 475.

Records and costs, *see* Nos. 157, 406, 506, 519.

PRODUCTION (GATHERING AND TREATMENT) (330).

GENERAL (PATENTS).

527. **Squires, Frederick.** Apparatus and method for recovering oil and gas. U. S. patent 1249232, Dec. 4, 1917.

528. ——— Method of recovering oil and gas. U. S. patent 1238355, Aug. 28, 1917.

OIL.

GAGING AND SAMPLING.

529. **Johnson, R. H., and Bernard, W. E.** A feasible plan for gaging individual wells. Bull. Am. Inst. Min. Eng., June, 1917, pp. 955–957: Discussion, January, 1918, pp. 100–101. Trans., vol. 57, 1918, pp. 1050–1052; discussion, pp. 1052–1053. Enumerates the advantages of recording the rate of production of individual wells, and gives two diagrams showing a plan for gaging the wells on a lease in rotation.

PATENT.

530. **Dodds, R. D.** Device for withdrawing samples from wells. U. S. patent 1247092, Nov. 20, 1917.

Gas and vapors, *see* Nos. 319, 527, 528.

COMPRESSORS AND CONDENSERS.

531. **Weymouth, T. B.** Efficiency in the operation of gas compressing stations. Proc. Nat. Gas Assoc. Am., vol. 9, 1917, pp. 93–101; discussion, pp. 101–110. Nat. Gas and Gasoline Jour., vol. 11, June, 1917, pp. 142–147. Discusses waste and inefficiency in the operation of early compressor stations, and describes the more economical methods of the present, such as the use of proper gas-measuring instruments, the oiling system, use of indicators, and economy of fuel and labor.

532. WYER, S. S. Development of the law relating to the use of gas compressors in natural gas production. Trans. Am. Inst. Min. Eng., vol. 54, 1916, pp. 301–317; discussion, pp. 318–324. Published first in Bull. Am. Inst. Min. Eng., February, 1916, pp. 263–279; discussion, May, 1916, pp. 946–952.

SEPARATION FROM OIL OR WATER (PATENTS).

533. LYNN, D. M. Gas-relief valve for oil wells. U. S. patent 1238165, Aug. 28, 1917.

534. SCHARPENBERG, C. C. Gas trap. U. S. patent 1226913, May 22, 1917.

PRODUCTIVENESS OF OIL AND GAS WELLS AND LANDS (340).

NATURAL FACTORS.

INFLUENCE OF WATER, *see* Nos. 211, 212; CAUSES OF DECLINE, *see* Nos. 72, 41.

ARTIFICIAL FACTORS, STIMULATION OF PRODUCTION.

INCREASE OF PRESSURE BY AIR OR GAS.

535. LEWIS, J. O. Methods for increasing the recovery from oil sands. Bureau of Mines Bull. 148, 1917. 128 pp. Describes particularly the application of compressed air.

536. WESTERN ENGINEERING. The Marietta compressed-air process for increasing the production of oil wells. Vol. 8, May, 1917, p. 172. Short discussion of the process taken from paper by J. O. Lewis which was read before the Petroleum Club of the University of California.

USE OF WATER, *see* No. 83.

ESTIMATING CONTENT OF OIL AND GAS LANDS.

537. PACK, R. W. The estimation of petroleum reserves. Bull. Am. Inst. Min. Eng., August, 1917, pp. 1121–1134; discussion, October, pp. 1866–1868. Trans., vol. 57, 1918, pp. 968–981; discussion, pp. 981–983. Met. and Chem. Eng., vol. 17, Sept. 1, 1917, pp. 227–232. Considers briefly the saturation method and, in greater detail, the production curve method. Concludes that the latter should be used in estimating reserves in producing fields; and that untested fields should be compared with producing areas which they resemble geologically, after the reserves in those areas have been estimated by the production curve method. Describes particular application of the method to a California field.

See also No. 401.

WASTES AND CONSERVATION (350).

538. BALL, M. W. Adequate acreage and oil conservation. Proc. Am. Min. Congress, vol. 19, 1916 (published 1917), pp. 322–333. After considering briefly the necessity for conservation, discusses glaring forms and causes of waste and loss of oil and gas and reasons for high price. Concludes that the fundamental cause is inadequate acreage which results in too close proximity of neighboring tracts in process of development and in premature production. Makes plea for the creation of popular sentiment in favor of adequate acreage and of eventual legislation toward this end.

539. **Johnson, R. H.** Legal and economic factors in the conservation of oil and gas. Proc. Second Pan American Scientific Congress 1915–1916 (Washington, 1917), vol. 8, Mining, Metallurgy, Economic Geology and Applied Chemistry, pp. 103–107; discussion, pp. 108–113. Discusses leasing and royalty methods, leasing and operation of public lands, control of wells and efficient operation of pipe lines to prevent waste, use of compressor plants, methods of rate fixing for gas, and general economy in utilization of oil and gas.

MINING SOLID BITUMENS (360).

540. **Engineers' Club of Philadelphia, Proceedings.** The asphalt industry. Vol. 34, January, 1917, pp. 11–17. Mining, refining, and uses of asphalt are discussed.

FINANCIAL DETAILS (APPRAISEMENTS, ROYALTIES, CONTRACTS, COSTS, PRICES) (390).

541. **Smith, C. G.** Cost accounting for oil producers. Bull. 158, Bureau of Mines, 1917. 123 pp. Describes and discusses balance sheets, profit and loss statements, and bookkeeping methods peculiarly adapted to the oil industry.

542. **Wyer, S. S.** Principles of natural gas leasehold valuation. Trans. Am. Inst. Min. Eng., vol. 56, 1917, pp. 782–795; discussion, pp. 796–798. Published also in Bull. Am. Inst. Min. Eng., April, 1916, pp. 747-760; discussion, December, 1916, pp. 2228–2230.

See also Nos. 190, 401, 539.

TRANSPORTATION, STORAGE AND DISTRIBUTION (400).

TRANSPORTATION, *see* Nos. 404, 405, 1041.

PIPE LINES (OIL OR GAS).

543. BAXTER, F. R. The storage and transportation of liquids. Jour. Ind. and Eng. Chem., vol. 9, October, 1917, pp. 978–979. A brief history of the development in the United States of water and pipe-line transportation of oil, and a short review of present methods of oil storage.

544. PETROLEUM WORLD. The trans-Atlantic pipe-line scheme. Vol. 14, March, 1917, pp. 124–125; August, pp. 361–362. Criticism of the scheme because of the strength of pipe necessary to stand the external pressure of such a line, and the inventor's reply. (For original description of the scheme, see Murphy, S. J. The trans-Atlantic pipe line. Petroleum World, vol 13, December, 1916, p. 588.)

CONSTRUCTION AND MAINTENANCE.

545. CEMENT ERA. Concrete natural gas mains. Vol. 15, November, 1917, p. 45. Tells of plan to pipe gas from the Terrebonne field, Louisiana, to New Orleans, in double concrete pipes of large diameter.

546. CLARKE, M. S. Welding gas mains. Nat. Gas and Gasoline Jour., vol. 11, December, 1917, pp. 349–350. Discusses the advantages of welded pipe, describes the apparatus used in the Oxweld process, gives its cost, and explains a few applications.

547. LUNGREN, E. E. Welding steel mains. Nat. Gas and Gasoline Jour., vol. 11, May, 1917. pp. 116–121. Discusses the advantages of oxyacetylene welding, apparatus and material needed, and testing the joints. Gives tables of cost data, including comparative costs of screwed and welded lines.

548. WESTERN ENGINEERING. Costs of oxyacetylene cutting and welding. Vol. 8, April, 1917, p. 154. Quotes cost tables issued by the National Tube Co.

See also Nos. 142, 215, 475.

PROTECTION AGAINST CORROSION.

549. NATURAL GAS AND GASOLINE JOURNAL. Nature destructive to pipe lines. Vol. 11, January, 1917, pp. 11–13. Results of an investigation in the vicinity of Cleveland, Ohio. Discusses causes and prevention of corrosion.

See also No. 475.

STATION EQUIPMENT.

550. NEWTON, N. A. The development of machinery for transportation of oil and gas. Oil City Derrick Supplement, Dec. 15, 1917, pp. 17, 19, 21, 23. Outlines improvements in methods of handling and transporting crude oil, particularly in regard to pumps and pumping engines.

LINE EQUIPMENT AND TOOLS.

551. **Kerr, T. H.** Automatic orifice meter control. Nat. Gas and Gasoline Jour., vol. 11, November, 1917, pp. 321–322. Describes with illustrations, an orifice meter with a differential relief valve of the positive-opening type controlled by gas pressure and the balancing of forces between a differential diaphragm and a weighted lever.

PATENTS.

552. **Bradford, C. W.** Antitheft device for contents of gas and other pipe-line systems. U. S. patent 1239870. Sept. 11, 1917.
553. **Durbin, V. S.** Swivel coupling for pipe lines. U. S. patent 1228541, June 5, 1917.
554. **Hall, G. C., and Bradshaw, Alfred.** Valve for pipes for conducting liquid and gaseous fluids. U. S. patent 1222758, Apr. 17, 1917.

See also Nos. 609, 1030.

Records and statistics, *see* No. 590; Financial costs, *see* Nos. 546, 547, 548, 590.

TANK CARS AND TANK WAGONS (CONSTRUCTION AND MAINTENANCE).

555. **Railway Age Gazette.** Large capacity tank cars for the Santa Fe. Vol. 63, Sept. 14, 1917, pp. 467–469. Description with diagrams of 12,000-gallon tank cars to be used for fuel oil designed according to the specifications of the Master Car Builders' Association for Class III tank cars as amended in 1916. Calls attention to several novel details of design.
556. **Way, E. S.** The tank car. Railway Rev., vol. 61, Dec. 29, 1917, pp. 801–803. Reviews history of tank-car specifications from 1903 to 1917. Gives classification of tank cars established by the Master Car Builders' Association in 1916, and quotes rules in regard to tank-car construction and maintenance.

PATENTS.

557. **Becker, Anton.** Tank car. U. S. patent 1237156, Aug. 14, 1917.
558. **De Meritt, L. M., and Zink, J. H.** Tank car. U. S. patent 1237484, Aug. 21, 1917.
559. **Waugh, J. M.** Tank car. U. S. patent 1248763, Dec. 4, 1917.

Water transportation, *see* Nos. 7, 8, 543.

TANK STEAMERS (CONSTRUCTION—PATENTS).

560. **Isherwood, J. W., and Stewart, J. W.** Tank vessels. English patent 16834, Mar. 28, 1917. Application dated Nov. 30, 1915.
561. **Laing, Hugh, and Ashby, E. W.** Ship for carrying liquid cargoes in bulk. U. S. patent 1234675, July 24, 1917.
562. **Lynn, J. J.** Ship for oil and molasses. Canadian patent 174282, Jan. 2, 1917.
563. **Yarrow, H. E.** Oil tank ships. English patent 105727, Apr. 26, 1917. Application 17697, Dec. 8, 1916.

See also Nos. 7, 633.

STORAGE (420).

564. JAMES, G. B. Oil storage. Proc. Am. Min. Congress, vol. 19, 1916 (published 1917), pp. 307–317. Nat. Fire Protect. Assoc. Quarterly, vol. 10, January, 1917, pp. 260–270. Describes briefly present methods of field storage. Discusses losses by evaporation, recommending the use of steel roofs on tanks; and by fire, giving causes and methods of fire protection, and suggesting further precautions.

See also Nos. 543, 611, 1029, 1041.

TANKS.

565. LANGARICA, A. Cimentacíon de tanques de almacenamiento de petróleo. (Foundation of petroleum storage tanks.) Bol. del Petróleo, vol. 4, November, 1917, pp. 424–428. Discusses methods of construction and materials.

PATENTS.

566. FERNANDEZ, ALPHONSO. Fuel tank. United States patent 1237891, Aug. 21, 1917.

STEEL AND IRON.

567. HERRICK, H. N. Tank earthwork. Min. and Sci. Press, vol. 114, Apr. 14, 1917, pp. 508, 510. West. Eng., vol. 8, June, 1917, pp. 218–219. Gives formulas and diagrams for calculating the quantities of earthwork involved in the preparation of sites for large steel tanks.

568. JOBSON, ARTHUR. Dimensions of storage tank for economical design. Eng. News-Rec., vol. 78, May 3, 1917, pp. 261–262. Gives formula for determining unit costs of specially designed tank or small reservoir with concrete bottom and steel sides.

PATENT.

569. LEWIS, HOWARD. Lubricating oil storage tank. U. S. patent 1246819, Nov. 13, 1917.

CONCRETE.

570. CAMPBELL, H. C. The use of concrete for oil storage tanks. Min. and Oil Bull., vol. 3, November, 1917, pp. 361–363, 384. Gives advantages of concrete tanks from a structural and economic standpoint, and mentions construction requirements. (See also Nat. Petroleum News, vol. 9, November, 1917, pp. 21–22.) Adds experience of several companies using concrete storage.

571. MENSCH, J. L. Concrete storage for the oil industry. Petroleum, vol. 3, September, 1917, pp. 49, 51. Calls attention to important details of construction of modern storage tanks and reservoirs, and to their economy.

572. NATIONAL PETROLEUM NEWS. Concrete storage practical for heavy oils. Vol. 9, August, 1917, pp. 28, 30, 32, 34. Discusses advantages of this kind of storage and important features of construction in concrete tanks.

573. SHAPINSKY, R. D. Reinforced concrete storage for road oil. National Petroleum News, vol. 8, February, 1917, pp. 58, 60–61. Describes underground vats of 50,000 gallons capacity, composition of the concrete, and arrangement of oil and steam lines.

574. STROYER, R. N. Reinforced concrete and oil. Petroleum Rev., vol. 37, Oct. 6, 1917, pp. 213–214. Discusses the use of reinforced concrete for oil storage tanks and tank ships. Since mineral oils and tar have been found by investigation to have no deleterious effect on cement or concrete, these materials are shown to be practicable for such purposes.

PATENT.

575. **Munn, M. J.** Crude oil storage tank. Canadian patent 176123, Apr. 3, 1917. English patent 103276, Jan. 18, 1917. Application 12894, Sept. 12, 1916.

See also Nos. 214, 568.

Reservoirs (concrete lined), *see* No. 571.

STORAGE OF BUNKER OILS (PATENT).

576. **Laurenti, Cesare.** Liquid fuel reservoir in submarine vessel. U. S. patent 1219115, Mar. 13, 1917.

TANK AND RESERVOIR EQUIPMENT (PATENTS).

577. **Augenbraun, P F.** Closure for gasoline or other liquid tanks. U. S. patent 1212878, Jan. 16, 1917.
578. **Boryszewski, Joseph, Jr.** Gasoline tank and gage for same. U. S. patent 1249010, Dec. 4, 1917.
579. **Boyce, Leonora.** Gasoline-tank filler and gage. U. S. patent 1217693, Feb. 27, 1917.
580. **Fardon, C. C.** Storage tank. U. S. patent 1218600, Mar. 6, 1917.
581. **Hurlbrink, Ernst.** Apparatus for discharging liquids. U. S. patent 1243298, Oct. 16, 1917.
582. **McCrabb, W. D.** Automatic shut-off for oil tanks. U. S. patent 1235825, Aug. 7, 1917.
583. **Mibes, B. A.** Attachment for liquid-fuel tanks. U. S. patent 1231774, July 3, 1917.
584. **Raymond, G. E.** Air pump for gasoline tanks. U. S. patent 1222030, Apr. 10, 1917.

See also Nos. 587, 599, 600, 602, 603, 607, 608, 615, 618–622, 624–628, 630, 631.

TEMPORARY AND SMALL CONTAINERS.

585. **Adkins, L. R.** Transportation and storage of liquids in small packages. Jour. Ind. and Eng. Chem., vol. 9, Oct., 1917, pp. 979–980. Describes small containers, such as barrels and tin cans in use at the present time for carrying and storing petroleum and its products.

EQUIPMENT (PATENT).

586. **Chynoweth, H. W.** Gasoline tank and filter. U. S. patent 1235438, July 31, 1917.

See also Nos. 598, 601, 604.

LOSSES.

587. **Gardner, H. A.** Paint researches and their practical application. Washington, D. C., Press of Judd and Detweiler (Inc.), 1917. 384 pp. Discusses (pp. 262–263) the heat-reflecting properties of colors as shown by experiments with metal tanks containing benzine. (See also Circular 44, Paint Manufacturers' Association of the United States. Educational Bureau, Scientific Section, 1917.) Sci. Am., vol. 116, Feb. 10, 1917. p. 151. (From paper read before the Pennsylvania State Association of Master Painters and Decorators.)

588. NATIONAL PETROLEUM NEWS. Cutting the gasoline loss to 1 per cent. Vol. 9, November, 1917, pp. 34, 36, 38. Describes devices adopted by various companies to reduce loss from evaporation in storage, and the need for careful handling by plant employees.

589. WISE, K. M. The conservation of petroleum. Oil Age, vol. 13, Nov., 1917, pp. 10–15. Describes the Farr system of storage and handling as a preventive against loss by evaporation and fire.

See also Nos. 539, 564, 580, 619.

RECORDS AND STATISTICS, *see* Nos. 567, 590; FINANCIAL COSTS, *see* Nos. 568, 590.

MEASUREMENT OF VOLUMES AND WEIGHTS, GAGING AND METERING (430).

590. DONOGHUE, A. M. Crude petroleum transportation and accounting. Texaco Star, vol. 4, July, 1917, pp. 7–10. Explains methods of measuring and gaging oil in its transportation from wells to settling tanks, and through pipe lines and pump stations to large steel tanks for storage; also methods used in financial accounting and in recording of runs by pipe lines.

591. FISHER, F. P. Establishing a standard of measurement for natural gas in large quantities. Trans. Am. Soc. Mech. Eng., vol. 38, 1916 (New York, 1917), pp. 241–280; discussion, pp. 280–284. Published first in Jour. Am. Soc. Mech. Eng., vol. 38, September, 1916, pp. 681–692; discussion, pp. 692–694. Deals with the methods used in the Mid-Continent field by a company which operates over 1,200 miles of gas pipe lines. Describes, with their advantages and disadvantages, various means of measuring gas, and a specific problem of loss in this field, discussing particularly the use of large capacity measurements with orifice meters.

592. GWINNER, HARRY. Volume of tanks with spherical ends. Jour. Eng. Club of Baltimore, vol. 7, November, 1917, pp. 75–78. Explains method.

593. NORTON, KENNETH. The flow of gas in pipes. A new chart. Gas World, vol. 66, Mar. 31, 1917, pp. 256–257. Gives formula and graphs for calculating flow of gas through pipes.

594. SCHAPHORST, W. F. Flow through pipes. Gas Age, vol. 39, Feb. 1, 1917, pp. 115–116. Gives chart for calculating flow of gas or liquid flow through a pipe of known internal diameter at a given velocity, and for finding diameter and velocity when the other factors are known.

595. SCHLINK, F. J. Liquid-measuring pumps. Bureau of Standards Tech. Paper 81, 1917. Second ed., 27 pp. First ed., 1916.

596. WALTER, C. M., and MARSH, R. G. Measuring gas under varying conditions of temperature and pressure. Gas World, vol. 66, Feb. 17, 1917, pp. 129–131. Describes method.

PATENTS.

597. DELANOY, F. W. Liquid measuring device. U. S. patent 1235120, July 31, 1917.

598. DIMOND, M. M. Fluid gage. U. S. patent 1231339, June 26, 1917.

599. FLEGEL, H. D. Liquid gage. U. S. patent reissue 14314, June 5, 1917. Original No. 1067477, July 15, 1913.

600. FLETCHER, S. R., and SPEIGHT, ALFRED. Liquid level indicator. English patent 105986, June 27, 1917. Application 6518, May 6, 1916.

601. **Gross, J. J.** Gage for gasoline tanks. U. S. patent 1242176, Oct. 9, 1917.

602. **Knowles, J. B.** Oil level indicator. U. S. patent 1246757, Nov. 13, 1917.

603. **Oeschger, W. I.** Tank gage. U. S. patent 1211482, Jan. 9, 1917.

604. **Ritz-Woller, O. C.** Gasoline gage. U. S. patent 1231300, June 26, 1917.

605. **Rogers, J. F.** Fuel-tank gage. U. S. patent 1225178, May 8, 1917.

606. **Rosendaht, N. M.** Liquid-metering tank. U. S. patent 1210988, Jan. 2, 1917.

607. **Stephan, August.** Oil measure for tanks. Canadian patent 179950, Oct. 23, 1917.

608. **Wentz, Orville.** Tank gage. U. S. patent 1238231, Aug. 28, 1917.

609. **Werner, E. E.** Method of and apparatus for measuring the volumetric flow of gases. English patent 108711, Oct. 10, 1917. Application 11473, Aug. 14, 1916.

See also Nos. 551, 578, 579.

FIRE HAZARDS AND PREVENTION (440).

610. **The Bureau for the Safe Transportation of Explosives and Other Dangerous Articles.** Report of the chief inspector, February, 1917. 104 pp. Report for the year 1916, including, in addition to statistics in regard to fires in the transportation of gasoline and other inflammable liquids, details of fires and accidents during the year.

611. **Colwell, P. A.** Precautions in fuel-oil storage. Power, vol. 45, June 26, 1917, pp. 886–887. Abstract of paper read before the Providence, R. I., Engineering Society. Describes the proper method of storing fuel oil, and precautions such as using underground tanks inclosed in concrete, drawing all oil back into the tank, and providing tanks with automatic fire extinguishers.

612. **Dunn, B. W.** Why drain automobile tanks unnecessarily? Automobile, vol. 37, Sept. 13, 1917, p. 458. Explains why the draining of tanks of automobiles before shipment on railroads is dangerous.

613. **Geyer, O. R.** Fires in the oil fields. Sci. Am. Suppl., vol. 83, Feb. 24, 1917, pp. 120–121. General discussion of oil field fires from various causes, and descriptions of the extinguishing of extremely difficult fires.

614. **National Fire Protection Association Quarterly.** Southwest oil field fires. Vol. 10, January, 1917, p. 271. Reviews losses of the year 1916.

615. **Petroleum.** Holmes perfects oil-tank fire extinguisher. Vol. 4, December, 1917, p. 66. Describes invention of O. J. Holmes, to be placed at the base of a tank.

616. **Petroleum Review.** The Blundell fire extinguishing system. Vol. 36, Mar. 17, 1917, p. 201. Describes system of ventilating, steaming, and extinguishing fire on board oil tankers, or on land in oil storage.

617. **Safety Engineering.** The foamite system for extinguishing oil fires. Vol. 34, December, 1917, pp. 416–421. Explains principle, advantages, and operation of the system.

PATENTS.

618. **Bowles, W. M.** Safety vent for crude oil storage tanks. U. S. patent 1238983, Sept. 4, 1917.

619. **Clifton, H. W., and Clifton, George.** Storage-oil-tank protector. U. S. patent 1233028, July 10, 1917.

620. CROMPTON, T. A., JR., and CROMPTON, FRANK. Steaming apparatus for petrol tanks and the like. U. S. patent 1245878, Nov. 6, 1917. English patent 109946, Nov. 21, 1917. Application 5928, Apr. 26, 1917.

621. EARLE, G. W. Method of preventing or extinguishing fires in oil tanks. U. S. patent 1221038, Apr. 3, 1917.

622. ERWIN, J. B., and ERWIN, O. R. Apparatus for extinguishing fires. U. S. patent 1216789, Feb. 20, 1917.

623. ——— Quick-acting foam compound for extinguishing fires. U. S. patent 1247803, Nov. 27, 1917.

624. GORDON, J. M. Mode of protecting storage structures from lightning. U. S. patent 1239477, Sept. 11, 1917.

625. HANNON, LUKE. Device for protecting crude oil tanks. U. S. patent 1229261, June 12, 1917.

626. JACKSON, F. B. Lightning-protective attachment for oil tanks and other structures. U. S. patent 1251037, Dec. 25, 1917.

627. OWENS, W. D. Means for preventing fires in tanks, etc. U. S. patent 1213686, Jan. 23, 1917.

628. PYZEL, DANIEL. Fire-extinguishing apparatus. U. S. patent 1246657, Nov. 13, 1917.

629. ROSENTHAL, J. Fire-extinguishing foam. Norwegian patent 28167, Aug. 13, 1917.

630. SCOTT, C. N. Explosion hatch for oil containers. U. S. patent 1219493, Mar. 20, 1917.

631. SLATER, W. A. Fire extinguisher (for oil tanks). U. S. patent 1236220, Aug. 7, 1917.

See also Nos. 141, 564, 589.

LOCAL DISTRIBUTION (450).

PATENT.

632. KERN, E. N. Liquid fuel dispensing apparatus. U. S. patents 1210811 and 1210812, Jan. 2, 1917.

LEGISLATION AND REGULATION (470).

633. AMERICAN BUREAU OF SHIPPING. Rules for the classification and construction of steel ships. New York, 1917. 141 pp. Section 30 (pp. 85–91) gives rules for ships intended to carry oil in bulk.

See also No. 556.

MISCELLANEOUS (490).

634. MOHRHARDT, L. E. Flood lighting in the oil fields for police protection. Gen. Elec. Rev., vol. 20, October, 1917, pp. 816–817. One thousand oil tanks scattered over an area of 50 square miles are protected by the installation of flood lights.

See also No. 541.

PROPERTIES AND THEIR DETERMINATION (500).

634a. HENDRICK, ELLWOOD. Everyman's chemistry. New York, 1917. 374 pp. Contains chapter (pp. 235–246), on paraffin and petroleum bodies; also chapters (pp. 247–257) on olefins and acids, and (pp. 315–325) on aromatic compounds.

GENERAL, *see also* Nos. 193, 404; PHYSICAL, *see* No. 1039.

OPTICAL (REFRACTIVITY).

635. SCOTT, JAMES. Petroleum under the microscope. 1. Sulphurous petroleum—a microscopical inspection. 2. Petroleum jelly—its microscopical formation. 3. The crystallization of paraffin wax. 4. Limestone in relation to oil. 5. Cholesterin as proof of organic origin. 6. Sulphuric acid and caustic soda. 7. Oil sands and sandstones. 8. Ozkerite or natural paraffin wax. Petroleum World, vol. 14, May, 1917, pp. 206–207; June, pp. 263–265; July, pp. 296–298; August, pp. 347–349; September, pp. 396–397; October, pp. 441–443; November, pp. 490, 492; December, pp. 528–529.

See also No. 707.

DENSITY.

636. SCHAPHORST, W. F. Lubricating oil density. Power plant Eng., vol. 21, Nov. 1, 1917, p. 860. How to find the density of an oil without a hydrometer.

See also Nos. 136, 216, 698, 699, 702, 708, 716, 750, 1372.

THERMAL, *see* No. 712; SPECIFIC HEAT AND LATENT HEATS, *see* Nos. 743, 778.

BOILING POINTS AND VAPOR PRESSURES. EVAPORATION, VOLATILITY, FRACTIONAL DISTILLATION.

637. ASHWORTH, A. A. Distillation tests and their import. Nat. Petroleum News, vol. 9, April, 1917, pp. 18, 20, 22. Discusses the adoption of the distillation test as a criterion of quality of gasoline rather than the specific gravity test; and the importance of the low temperatures at the end of distillation of the first 10 or 20 per cent, rather than at the initial and end points. Illustrated by curves.

637a. DIETERICH, K. (Evaporation velocities and evaporation curves of motor fuels.) Petroleum Ztschr., Jahrg. 12, 1917, pp. 676–677. Chem. Zentr., 1919, II, p. 31. Jour. Soc. Chem. Ind., vol. 38, April 30, 1919, p. 244A.

See also Nos. 683, 696, 702, 705, 716, 746, 747, 748, 750, 1372, 1417.

MELTING POINTS, CRYSTALLIZATION, COLD TESTS, CONGEALING POINT, *see* Nos. 638, 679, 689, 702, 736.

LUBRICATING VALUE.

638. BATTLE, J. R. Lubricating engineering. Nat. Petroleum News, vol. 9, Dec. 12, 1917, pp. 82–84. Considers the importance and determination of the viscosity of lubricating oil, and briefly, the flash point and cold test determinations.

638a. BATTLE, J. R. Lubricating engineers handbook. A reference book of data, tables, and general information for the use of lubricating engineers, oil salesmen, operating engineers, mill and power plant superintendents, and machinery designers, etc. Philadelphia, London, J. B. Lippincott Company, 1917. 333 pp. Gives properties and methods of testing lubricants, and methods of lubricating various kinds of machinery.

639. ——— Lubrication reduces loss of energy due to friction. Nat. Petroleum News, vol. 9, November, 1917, pp. 86–87. Explains briefly the purpose of lubrication, and enumerates the qualities necessary in an efficient lubricant.

640. ——— Study of effect of lubrication on friction. Nat. Petroleum News, vol. 9, November, 1917, pp. 84, 86. Explains the meaning of different kinds of friction and coefficient of friction, and states briefly the laws of fluid friction, which are most important in lubrication.

641. CHURCH, A. T. Forced lubrication. Jour. Am. Soc. Naval Eng., vol. 29, August, 1917, pp. 443–450. Includes discussion of qualities necessary in lubricating oils, and tests of their lubricating value.

642. DEMARY, R. C. Lubrication of Diesel engines. Gas Engine, vol. 19, April, 1917, pp. 170–173. Prac. Eng., vol. 21, June 15, 1917, pp. 508–509. Requirements of suitable lubricants, and important points in successful cylinder lubrication.

643. HAMMOND, E. K. Lubrication of cutting tools. Machinery, vol. 23, January, 1917, pp. 373–391; February, pp. 490–499; March, pp. 595–607; April, pp. 701–710. Includes discussion of the selection of suitable oils, giving the necessary characteristics of oils and compounds for cooling and lubricating metal tools; discusses also the theory of lubricating and cooling, methods of applying lubricants to tools, recovery, filtration and sterilization of the oils; describes laboratory tests of oils and cutting compounds; gives Navy Department specifications for soluble oils, cutting compounds, etc.

644. HORNER, G. W. F. Some notes on the lubrication of air compressors. Petroleum World, vol. 14, December, 1917, pp. 535–540. Paper before the Diesel Engine Users' Association, Nov. 15, 1917. Includes discussion of the selection and suitability of oils for this purpose in connection with Diesel engines.

645. LEDBETTER, S. S. Principles of lubrication. National Engineer, vol. 21, July, 1917, pp. 273–276. Explains laws of friction, and discusses the selection of suitable lubricating oils and their properties.

646. MACINTIRE, H. J. The selection of a lubricating oil. Power, vol. 45, June 26, 1917, pp. 865–869. Discusses the effect of the viscosity of an oil on the fluid pressure maintained in a journal, and gives tests for lubricants.

647. NATIONAL PETROLEUM NEWS. Brick plant has two lubrication problems. Vol. 9, March, 1917, pp. 34, 36, 38. Explains the requirements and functions of lubricating oils in brick plants.

648. O'NEILL, J. G. Examination of oils from the Atlantic Fleet before and after use. Jour. Am. Soc. Naval Eng., vol. 29, May, 1917, pp. 325–338. Results of chemical tests of "force-feed lubricating oils before and after use to determine the amount and nature of the changes which force-feed lubricating oils undergo in service, and to designate the simplest manner in which to treat used oils in order to make them of as good quality as before."

649. PARISH, W. F. Flash and fire tests. Lubrication, vol. 4, January, 1917, pp. 2–5. Discusses the variation, in lubricating oils from different crudes, of flash and fire points, their importance as tests in selecting suitable lubricating oils, and the change of opinion as to flash point among engineers and manufacturers of oils with the introduction and development of the internal-combustion engine.

650. ——— The "seal" theory. Lubrication, vol. 4, March, 1917, pp. 2–8. Discusses undesirable changes in the physical characteristics of lubricating oils during use, due to lack of "seal," or the ability of the oil to make or hold a "seal" against leakage of gas, or heavy ends of gasoline, into the lubricating oil, during the working of the motor. Makes suggestions as to oils to be chosen in order to avoid this leakage, based on tests extensively carried out by the Texas Co.

651. SQUIRE, A. J. A talk about your lubricating oils. Petroleum World, vol. 14, December, 1917, pp. 540–543. Discusses the disadvantages of fluid oil for lubricating purposes, such as its high cost and the large amount wasted during use. Enumerates the requirements of an ideal lubricant.

See also Nos. 636, 652, 685, 689, 694, 714, 715, 724, 752, 753, 754, 756, 1436.

OTHER PROPERTIES OF LIQUIDS.

652. DUBRISAY, R. Methode d'essai des huiles de graissage. [Method of testing lubricating oils (viscosity)]. Annales Ralsif., t. 10, 1917, pp. 301–304. Jour. Soc. Chem. Ind., vol. 36, Nov. 15, 1917, p. 1123. Chem. Abs., vol. 12, May 10, 1918, p. 1005. Describes apparatus and method.

653. HERSCHEL, W. H. Determination of absolute viscosity by the Saybolt universal and Engler viscosimeters. Proc. Am. Soc. Testing Materials, vol. 17, part 2, 1917, pp. 552–568; discussion, p. 569. Summary, p. 551.

653a. ——— The determination of absolute viscosity by short-tube viscosimeters. Bureau of Standards Tech. Paper 100, 1917. 55 pp. Says that Engler and Saybolt viscosimeters, usually employed in the oil trade, are unsuitable because of their short outlet tubes.

654. ——— Resistance of an oil to emulsification. Bureau of Standards Tech. Paper 86, 1917. 37 pp. Gives proposed emulsification test for oils, more definite than tests previously described and calculated to increase the efficiency of lubricating oils in forced-feed lubrication. Describes method and apparatus used, explains the theory of emulsification, and shows the relation between demulsibility and other physical properties of oils, and between demulsibility and chemical tests. Concludes that oils of high demulsibility give most satisfactory service. For preliminary account of test, see Proc. Am. Soc. Test. Materials, vol. 16, part 2, 1916, pp. 248–265.

655. HIROBE, T., OGAWA, W., and KUBO, S. Electrical insulating properties of transformer oil. Electrician, vol. 78, Mar. 2, 1917, pp. 656–657. Abstract of report by the Electro-Technical Laboratory of Tokyo on an investigation started with the object of standardizing commercial methods of testing. Discusses the effect of the presence of dust in an insulating oil, the effect of temperature of an oil on its dielectric strength, and the effect of moisture in the oil.

656. RAKUZIN, M. A. (Irreversible adsorption of the carbonaceous substances of naphtha.) Jour. Russ. Phys. Chem. Soc., vol. 48, 1916, pp. 720–724; Chem. Abs., vol. 11, Apr. 10, 1917, p. 782; Jour. Chem. Soc., vol. 112, March, 1917, p. i 109. Jour. Soc. Chem. Ind., vol. 36, Mar. 15, 1917, p. 284. Study of the adsorption of a 1 per cent solution of petroleum in benzene by animal charcoal and by calcined kaolin.

657. ——— (New classification of the processes of adsorption and importance of the theory of adsorption for various branches of natural science.) Jour. Russ. Phys. Chem. Soc., vol. 48, 1916, pp. 90–94. Jour. Chem. Soc. Abs.; vol. 112, pt. 2, February, 1917, p. ii 72. Classifies types of adsorption and in a discussion of the practical application of the processes includes the removal of the solid paraffin from petroleum, so that it may be more easily transported through pipes in winter.

658. **Rakuzin, M. A.** (Relation between filtration and adsorption of naphtha paraffins.) Jour. Russ. Phys. Chem. Soc., vol. 48, 1916, pp. 718–720; Chem. Abs., vol. 11, Apr. 10, 1917, p. 782. Jour. Chem. Soc., vol. 112, March, 1917, p. i 109.

See also Nos. 215, 638, 694, 702, 710, 725, 726, 728, 731, 1039, 1415, 1416.

Other properties of solids, *see* Nos. 686, 688, 692, 706, 733, 736, 762, 1417.

CHEMICAL PROPERTIES (520).

659. **Fryer, P. J., and Weston, F. E.** Technical Handbook of Oils, Fats and Waxes. Cambridge University Press, 1917, vol. 1. 279 pp. Treats of the chemistry and technology of oils, fats, and waxes of mineral, as well as of animal and vegetable, origin.

660. **Rittman, W. F.** What petroleum is. Nat. Petroleum News, vol. 9, April, 1917, pp. 12–13; May, pp. 38, 40, 42, 44, 46, 48. Notes chemical elements found in petroleum, how petroleum is related to other substances made up of these elements, and how the relationship and structure of the hydrocarbon molecules affect the behavior of oils in commercial processes.

THERMOCHEMICAL.

FLASH AND BURNING POINTS, IGNITION POINTS, AND IGNITION MIXTURES.

661. **Coste, J. H.** Note on the inflammability of petroleum spirit at low temperatures. Analyst, vol. 42, May, 1917, pp. 168–170. Asserts that the Abel tester is not adapted for giving numerical results below a temperature of about 60°, and gives as results of tests of several motor spirits in thin test tubes covered with a cardboard cover that the oils flash at temperatures from —30° to —9.50° C.

662. **McDavid, J. W.** The temperature of ignition of gaseous mixtures. Jour. Chem. Soc., vol. 111, November, 1917, pp. 1003–1015. Gives values for mixtures of air with coal gas, ethylene, petrol, benzone, ether, and other gases.

663. **Moore, Harold.** Spontaneous ignition temperatures of liquid fuels. Engineer, vol. 123, June 22, 1917, pp. 561–562. Discusses this temperature as a means of deciding suitable maximum and minimum engine compressions on petrol or Diesel engines using any given liquid fuel. Gives table of ignition points of various liquid fuels in oxygen.

664. ——— Spontaneous ignition temperatures of liquid fuels for internal-combustion engines. Jour. Soc. Chem. Ind., vol. 36, Feb. 15, 1917, pp. 109–112. Describes apparatus specially devised to determine these temperatures and the method of operating it. Discusses the importance of the application of the test to internal-combustion engine fuels, and gives long table of the temperatures so determined for petroleum distillates, crude petroleum, shale oils, tar distillates, and tars.

See also Nos. 638, 649, 687, 702, 717, 721, 735, 1081, 1417.

CALORIC POWER AND CALORIMETRY.

665. **Bureau of Standards.** Gas calorimeter tables. Circular 65, 1917. 19 pp. A brief summary of the full instructions for using a gas calorimeter given in Bureau of Standards Circular 48, 1916, with the addition of tables needed for daily laboratory use. (See Bureau of Standards Circular 48, 1916. Standard methods of gas testing.)

666. **de Girard, —, and Lauriol, P.** Determining the heating value of gas. Gas World, vol. 66, Feb. 17, 1917, pp. 132–133. Describes method and apparatus used by the Paris Municipal Lighting Laboratory.

666a. HILPERT, S. (Calorific value of various fuels and motor spirits.) Ges. Abhandl. zur Kenntnis der Kohle, 1917, I, pp. 269–270. Chem. Zentr., Jahrg. 90, 1919, II, p. 621. Jour. Soc. Chem. Ind., vol. 38, Aug. 15, 1919, p. 525A.

667. RICHARDS, T. W., and DAVIS, H. S. Improvements in calorimetric combustion and the heat of combustion of toluene. Proc. Nat. Acad. Sci., vol. 3, January, 1917, pp. 50–58; Jour. Am. Chem. Soc., vol. 39, March, 1917, pp. 341–354. A study to obtain further knowledge of a more precise nature concerning the heats of combustion of typical compounds of carbon, and further development of a method of determination.

668. SIBLEY, ROBERT, and DELANY, C. H. Determination of heating value of oils. Jour. Elec., vol. 39, Dec. 15, 1917, pp. 555–557. Gives mathematical formulas for computing heating value when the ultimate analysis of an oil is known. Describes principle and operation of fuel oil calorimeters.

See also Nos. 723, 729, 734, 740, 741, 745, 1049.

THERMAL DECOMPOSITION OR CRACKING.

669. EGLOFF, GUSTAV, and MOORE, R. J. The cracking of an aromatic base oil, the temperature factor at constant rate under pressure. Jour. Ind. and Eng. Chem. vol. 9, Jan. 1, 1917, pp. 40–42. A study of the formation of benzene and toluene from an aromatic base oil—solvent naphtha—at temperatures from 500–800° C., at the rate of flow of 15 gallons per hour, and 11 atmospheres pressure. Conclusion is that an aromatic base oil—solvent naphtha—is the most satisfactory, for the resulting benzene and toluene are of a high degree of purity, and the process is easy.

670. ——— Stability of paraffin hydrocarbons. Met. and Chem. Eng., vol. 16, Jan. 1, 1917, pp. 47–51. Gives results of experiments in support of the contention that, contrary to general belief, the simpler petroleum hydrocarbons are less stable at higher temperatures than those of higher molecular weight.

671. ZANETTI, J. E., and EGLOFF, GUSTAV. Aromatic hydrocarbons from the thermal decomposition of natural gas condensate. Jour. Ind. and Eng. Chem., vol. 9, May, 1917, pp. 474–478. Describes investigation which proved that natural gas condensate yields aromatic hydrocarbons from simple to highly complex varieties. An apparatus is described for obtaining these hydrocarbons readily, and the precipitation of the tar "fog" by electrical precipitation.

672. ——— The thermal decomposition of benzene. Jour. Ind. ann Eng. Chem., vol. 9, Apr. 1, 1917, pp. 350–356. An investigation to "study more completely the course of reaction of the decomposition of benzene, in order to arrive at some definite conclusions regarding its behavior at high temperatures and gradually gain insight into the complicated mechanism of formation of cylic and polycyclic compounds from straight chain hydrocarbons." Describes apparatus and experiments, and gives data of results in curves and tables.

See also Nos. 723, 757, 911.

HEAT OF FUSION.

673. ENKLAAR, C. J. Sur les points de fusion de quelques hydrocarbures. (The points of fusion of several hydrocarbons.) Recueil des travaux chimiques des Pays Bas et de la Belgique, vol. 36, 1917, No. 5, pp. 247–249.

674. VON KOZICKI, G., and VON PILAT, S. (Heat of fusion of paraffin wax.) Chem. Umschau, 71, 1917. Chem. Ztg., Jahrg. 42, 1918, Rep., p. 147. Jour. Soc. Chem. Ind., vol. 37, Nov. 30, 1918, p. 681A.

ELEMENTARY ANALYSIS (SULPHUR).

675. ANDREWS, H. M. Determination of sulphur in crude oil. Chemist-Analyst, No. 22, July, 1917, pp. 21–22. Describes method easily handled and requiring inexpensive apparatus.

676. FRANCIS, C. K. and CRAWFORD, C. W. The detection and determination of sulphur in petroleum. Jour. Ind. and Eng. Chem., vol. 9, May, 1917, pp. 479–481. Describes investigation to determine a reliable test, and a method for making accurate determinations without complicated or expensive apparatus. The methylene blue test detects any form of sulphur in petroleum with extreme delicacy. Fusion with sodium peroxide in a bomb and the modified Dammer combustion method determine sulphur in crude oil.

677. MARCUSSON, J. (Sulphur and oxygen compounds of mineral oils.) Mitt. k. Materialprüf., 1917, pp. 374–380; Ztschr. angew. Chem., Jahrg. 31, 1918, Ref., p. 62. Jour. Soc. Chem. Ind., vol. 37, June 29, 1918, p. 329A. (Abstract.) Heavy oils contain more sulphur than light oils. Compounds of sulphur and oxygen are in dark oils mainly, among solid resinous and asphaltic constituents, the latter containing a higher percentage of sulphur and oxygen than resins.

See also Nos. 216, 635, 702, 750, 973, 1409.

ANALYTICAL NUMBERS (IODINE, BROMINE, SAPONIFICATION, ETC.,) *see* Nos. 702, 711, 712; HYDROCARBONS, HYDROCARBON DERIVATIVES, *see* No. 660; OXYGEN COMPOUNDS, *see* No. 677; CHOLESTERIN, *see* No. 635; HALOGEN COMPOUNDS, *see* No. 709; WATER AND SOLID IMPURITIES, SAND, B. S., ETC., *see* No. 655; ASH CONTENT, *see* No. 736.

DETECTION OF MIXTURES AND ADULTERANTS.

678. CONDELLI, S. (The detection of mineral oil, vaseline and paraffin in fish oil. Preliminary note.) Staz. sper. agr. ital., volume 50, 1917, pp. 73–75. Chem. Abs., vol. 12, Feb. 20, 1918, p. 433. Method described of detecting presence of a mineral oil or vaseline and of the measurement of the amount.

679. FORMÁNEK, JAROSLAV, KNOP, JOSEF, and KORBER, JOSEF. (Examination of light petroleums and benzenes. Chem. Ztg., Jahrg. 41, 1917, pp. 713 714, 730–731. Jour. Chem. Soc., vol. 112, December, 1917, p. ii 581. Gives methods of detecting benzene and turpentine in light petroleums. Discusses the freezing point as an indication of the composition of an oil. Also in Chem. Abs., vol. 12, Aug. 10, 1918, p. 1596. Ztschr. angew. Chem., Jahrg. 31, 1918, Ref., pp. 62–63. Jour. Soc. Chem. Ind., vol. 37, June 29, 1918, p. 329A. (Benzines and benzols.)

680. HOLDE, D. (Colloidal graphite in oil.) Chem. Ztg., Jahrg. 41, 1917, pp. 32–33. Jour. Soc. Chem. Ind., vol. 36, Feb. 28, 1917, p. 214. Describes method of determination.

See also Nos. 691, 707.

MISCELLANEOUS AND SPECIFIC TESTS.

681. MEIGS, J. V. Observations on the action of sulphur monochloride on bituminous and tarry substances and hydrocarbon oils. Jour. Ind. and Eng. Chem., vol. 9, July, 1917, pp. 655–658. Describes tests which showed that sulphur chloride gives hydrochloric acid gas as a product of the reaction; that sulphur monochloride is a good reagent for testing the comparative stabilities of transparent lubricating oils; and that sulphur monochloride in carbon disulphide is a good reagent for investigating the nature of bitumens and hydrocarbon oils.

PHYSIOLOGICAL PROPERTIES (530).

682. Burrell, G. A., and Gauger, A. W. Exhaust gases make air in closed garage unsafe to breathe. Nat. Petroleum News, vol. 8, January, 1917, pp. 62–64. Results of experiments made to determine the amount of carbon monoxide permeating the air of a garage after an automobile engine has been running a short while. Gives analyses of the air in nine cases and gives table showing, under good and bad carburation, the percentage of CO produced by different size engines, and the quantity of air necessary to dilute the exhaust gases to a permissible proportion.

683. Moore, William. Volatility of organic compounds as an index of the toxicity of their vapors to insects. Jour. Agr. Research, vol. 10, Aug. 13, 1917, pp. 365–371. Gives results of experiments on various organic compounds, including among the hydrocarbons petroleum ether, gasoline, kerosene, benzene, toluene, xylene, naphthalene, and camphene.

See also Nos. 9, 1441.

ANALYTICAL AND TESTING METHODS, DETERMINATION OF PHYSICAL AND CHEMICAL PROPERTIES, APPARATUS, AND PROCEDURE (540).

684. American Society for Testing Materials, Proceedings. Proposed tentative revision of standard method for distillation of bituminous materials suitable for road treatment. Vol. 17, part 1, 1917, pp. 474–475. Appendix I to report on road materials.

685. ——— Report of Committee D–2 on lubricants. Vol. 17, part 1, 1917, pp. 462–469.

686. ——— Report of Committee D–4 on road materials. Vol. 17, part 1, 1917, pp. 470–473.

687. ——— Report of Sub-Committee XI of Committee D–1, on paint thinners other than turpentine. Vol. 17, part 1, 1917, pp. 402–450. Deals entirely with methods for the determination of flash point and the selection of the most suitable form of tester, with detailed results of tests.

688. ——— Tentative method for the determination of softening point of bituminous materials other than tar products. Vol. 17, part 1, 1917, pp. 811–812. Description of the ring-and-ball method.

689. ——— Tentative tests for lubricants. Vol. 17, part 1, 1917, pp. 767–772. Describes the following tests: Specific gravity, cloud and pour tests, cold test, free acid, carbon residue.

690. Anderson, R. P. The determination of gasoline vapor in air. Jour. Ind. and Eng. Chem., vol. 9, Feb. 1, 1917, p. 142. Note published to correct an impression given in an article by Burrell and Robertson (Jour. Ind. and Eng. Chem., vol. 7, 1915, p. 112), that the combustion method for the determination of gasoline may be used successfully when the vapor occurs in large amounts in the air.

691. Bowrey, S. E. The estimation of toluene in crude petroleum. Jour. Inst. Petroleum Technologists, vol. 3, June, 1917, pp. 287–304; discussion, pp. 305–322. Petroleum Rev., vol. 36, May 19, 1917, pp. 351–352; June 2, pp. 385–386; June 9, pp. 401–402. Results of an investigation to satisfy the demand for precise information concerning the percentage of benzene and toluene in various crude oils and petroleum spirits, and to solve numerous problems connected with such determination. The extraction of aromatics from petroleum by means of liquid sulphur dioxide served as a basis for the method used. Results are tabulated for crude oil from Trinidad.

692. Capp, J. A., and Hull, F. A. Method for studying the effects of temperature upon the physical condition of asphalts, waxes, etc. Proc. Am. Soc. Test. Materials, vol. 17, part 2, 1917, pp. 628–634; discussion, pp. 635–639. Summary, p. 627.

693. Caven, R. M. A mercurial viscosimeter. Jour. Soc. Chem. Ind., vol. 36, Mar. 15, 1917, pp. 270–271; discussion, pp. 271–272. A detailed description, with illustration, of a viscosimeter designed to meet the need for an instrument capable of measuring accurately the viscosity of an oil from a small quantity.

693a. Chéneveau, C. Sur la mesure de la viscosité des huiles. (On the measurement of viscosity of oils.) Jour. de Physique, vol. 7, May–June, 1917, pp. 109–114. Chem. Abs., vol. 13, Nov. 20, 1919, p. 2805. Describes apparatus for measuring viscosity by the application of Poiseuille's law.

694. Conradson, P. H. Emulsification of mineral lubricating oils: Apparatus and test method. Jour. Ind. and Eng. Chem., vol. 9, February, 1917, pp. 166–167. Describes and illustrates a simple laboratory apparatus for determining the emulsibility and demulsification value of lubricating oils. Outlines method of testing, and tabulates results for turbine oil, crank-case oil, engine oil, and spindle oil. Published also in Proc. Am. Soc. Test. Materials, vol. 16, part 2, 1916, pp. 273–279.

695. Cope, W. C. A suggested form of viscosimeter. Jour. Ind. and Eng. Chem., vol. 9, November, 1917, pp. 1046. States the principle of the usual form of viscosimeter, and gives three definite points of criticism of instruments so constructed. Describes a centrifugal viscosimeter which is not subject to such criticism.

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697. Dean, E. W., and Hill, H. H. Determination of unsaturated hydrocarbons in gasoline. Tech. Paper 181, Bureau of Mines, 1917. 25 pp. A study of the experimental methods in common use for measuring degree of unsaturation, and comparison of numerical results of the various methods.

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699. ——— A specific gravity balance for gases. Bureau of Standards Tech. Paper 89, 1917. 20 pp. Report of an investigation, made at the request of certain natural gas companies, to determine a more precise method of determining the densities of gases than the effusion method. Describes method selected, apparatus and its operation, and laboratory and field tests made with it. The principle employed is based on the laws of compressibility and buoyant effect of gases. *See also* No. 708.

700. Egloff, Gustav. The analysis of light oils. Met. and Chem. Eng., vol. 16, Mar. 1, 1917, pp. 259–263. Describes a specially designed apparatus for the rapid and accurate analysis of light oils from the distillation of coal, shale, or petroleum. Gives advantages, and method of using.

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703. ——— Gas analysis. A chapter (pp. 687–738) in "Standard Methods of Chemical Analysis," edited by W. W. Scott, 2d edition, revised, 1917. 898 pp. Describes various tests.

704. ——— Gas and Fuel Analysis for Engineers. A compend for those interested in the economical application of fuel. 8th rev. ed. 145 pp. Prepared especially for the use of students at the Massachusetts Institute of Technology.

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711. LUKENS, A. R. Distinguishing between petroleum residiums and the various fat pitches. Chemist-Analyst, No. 20, January, 1917, pp. 3–5. Describes method of determining the saponification values of these materials as a means of identifying them.

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718. PETROLEUM WORLD. The differentiation and testing of light motor fuels and their war-time substitutes. Vol. 14, January, 1917, p. 11. Tells of the invention of Dr. Karl Dietrich-Helfenburg for testing motor spirit at the front.

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723. Weisser, F. L. A convenient apparatus for determining heat efficiency of gas oil. Am. Gas Eng. Jour., vol. 106, May 5, 1917, pp. 441–442. Describes cracking device giving results which closely resemble operating conditions.

724. Woodruff, T. L. The analysis of grease mixture. Chemist-Analyst, No. 20, January, 1917, pp. 8–11. Gives various tests to be applied to mixtures such as lubricating greases or ointment bases and other preparations containing large amounts of petroleum products.

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726. Browning, Charles, Jr. Viscometer. U. S. patent 1244025, Oct. 23, 1917.

727. Burrell, G. A. Gas analysis. English patent 104179. Application 2119, Feb. 12, 1917. Not accepted.

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729. Crewson, G. G. Method of and apparatus for testing gases. U. S. patent 1245688, Nov. 6, 1917.

730. Crosweller, W. W. Instrument for recording percentage volumes of constituent gases. U. S. patent 1229587, June 12, 1917.

731. Flowers, A. E. Method and machine for determining viscosity. U. S. patent 1247523, Nov. 20, 1917.

732. Haupt, Hans, and Werner, Martin. Apparatus for indicating the composition of gases. U. S. patent 1220037, Mar. 20, 1917.

733. Howard, W. B. Automatically timed asphalt tester. U. S. patent 1225438, May 8, 1917.

734. Parr, S. W. Adiabatic calorimeter. U. S. patent 1247998, Nov. 27, 1917.

735. Tagliabue, C. J. Closed oil tester. U. S. patent 1236123, Aug. 7, 1917. *See also* No. 717.

See also Nos. 636, 643, 646, 652, 653, 654, 664, 665, 667, 668, 675, 676, 679, 736, 739, 746, 748, 750, 756, 1410, 1417.

Power and efficiency tests, *see* Nos. 1035, 1056, 1064.

SPECIFICATIONS FOR PURCHASES, ETC. (560).

736. American Society for Testing Materials, Proceedings. Tentative specifications for asphalt for use in damp-proofing and water-proofing. Vol. 17, part 1, 1917, pp. 712–715. Includes the following tests: Melting point, penetration, ductility, specific gravity, loss on heating, ash, and the carbon bisulphide test.

737. American Society of Civil Engineers. Final report of the special committee on materials for road construction and on standards and tests for their use. Proc. Vol. 43, December, 1917, pp. 2327–2408. Outlines principles to be covered in specifications for road building, bituminous and non-bituminous; gives definitions of terms used in highway work; and recommends (Appendix C) methods for testing bituminous materials. (See also West. Eng., vol. 9, February, 1918, pp. 60–62.)

738. Mullen, C. A. Specifications for asphalt paving; alternates for native and oil asphalts. Canadian Engineer, vol. 33, Nov. 8, 1917, p. 406.

739. United States Department of Agriculture. Standard forms for specifications, tests, reports, and methods of sampling for road materials. Bull. 555, 1917. 56 pp. Contribution from the Office of Public Roads. As recommended by the first conference of State Highway Testing Engineers and Chemists, Washington, D. C., Feb. 12–17, 1917. Includes tests and specifications for road oils and asphalts.

See also Nos. 67, 643, 696, 749, 756, 761, 1039, 1408.

VARIOUS SPECIES AND FRACTIONS OF BITUMENS AND PETROLEUMS (570).

GASEOUS PRODUCTS, INCLUDING NATURAL GAS.

740. Biddison, P. McD. The reduction in heating value due to recovery of gasoline content very slight. Nat. Gas and Gasoline Jour., vol. 11, August, 1917, pp. 213–214. Data presented to prove that this is true of natural gas after gasoline has been recovered. (See also Burrell, G. A., Biddison, P. M., and Oberfell, G. G. Extraction of gasoline from natural gas by absorption methods. Proc. Nat. Gas. Assoc. of Am., vol. 8, 1916, pp. 415–451; Burrell, G. A., and Seibert, F. M. The condensation of gasoline from natural gas. Bull. 88, Bureau of Mines, 1915.)

741. Burrell, G. A. Heating value of natural gas after extracting gasoline. Bessemer Monthly, No. 138, June, 1917, pp. 1–2, 4. Discusses the general advantages to the industry in the saving effected by the recovery of the gasoline from natural gas, and shows that the heating value of the gas is lowered very little thereby.

742. Burrell, G. A., and Robertson, I. W. The compressibility of natural gas and its constituents, with analyses of natural gas from 31 cities in the United States. Tech. Paper 158, Bureau of Mines, 1917. 16 pp.

743. Earhart, R. F. The ratio of specific heats and the coefficient of viscosity of natural gas from typical fields. Trans. Am. Soc. Mech. Eng., vol. 38, 1916 (New York, 1917), pp. 979–987; discussion, pp. 988–994. Published first in Jour. Am. Soc. Mech. Eng., vol. 38, November, 1916, pp. 888–890; discussion, vol. 39, February, 1917, pp. 139–141.

744. EARHART, R. F., and WYER, S. S. Deviation of natural gas from Boyle's law. Trans. Am. Soc. Mech. Eng., vol. 38, 1916 (New York, 1917), pp. 285–308; discussion, pp. 308–329. Published first in Jour. Am. Soc. Mech. Eng., vol. 38, September, 1916, pp. 695–700; discussion, pp. 700–708.

745. TOOKEY, W. A. Composition of power gases. Jour. Soc. Chem. Ind., vol. 36, Mar. 31, 1917, pp. 309–315; discussion, pp. 315–316. A study of the composition of power gases from the gas engine point of view. Concludes that, while there is no preference among power gases in regard to their relative composition, their purity, pressure, and uniformity are of far more importance than their calorific value.

See also Nos. 4, 662, 666, 671, 703, 708, 713, 727, 729, 730, 732, 938, 939, 1013, 1032.

VOLATILE FRACTIONS, INCLUDING MOTOR OILS, GASOLINES, NAPHTHAS, BENZINES.

746. BACON, C. V. Gasolines—analyses and interpretations. Petroleum Age, vol. 4, February, 1917, pp. 1–9. Account of an investigation to determine whether or not certain commercial gasolines were suitable for motor purposes, and whether the products manufactured by different organizations were of uniform character. The apparatus (with diagram), and method of operation are described for distillation tests of 20 samples, and the results tabulated. Concludes that gasoline is usually of an even better quality than required for motors. Gives distillation curves for several of the oils tested, with short discussion of each.

747. HANSCOM, W. W. Motor gasoline. West. Eng., vol. 8, December, 1917, pp. 471–473. Discusses requirements for satisfactory gasoline in the economical operation of automobiles, and gives table of results of fractional distillation of several samples of commercial gasolines used in San Francisco.

748. KERR, A. N., JR. Rates gasoline by computed index number. Nat. Petroleum News, vol. 9, Dec. 12, 1917, pp. 34, 36. Outlines a new method for finding and expressing quality of gasoline or naphtha. Involves a distillation test, plotting a distillation curve from that test, and measuring the area between the curve and the 560-degree line with a planimeter. From the index figure values can be found for particular products.

749. LEENHOUTS, W. J. Gasoline supply and its relation to specifications. Quarterly Jour. Univ. North Dakota, vol. 7, No. 3, April, 1917, pp. 251–260. Discusses the supply of gasoline and its relation to consumption, the properties of modern gasolines, and the bases of possible specifications.

750. LOMAX, E. L. The testing and standardization of motor fuel. Jour. Inst. Petroleum Technologists, vol. 4, December, 1917, pp. 6–25; discussion, pp. 26–36. Petroleum Rev., vol. 37, Oct. 20, 1917, pp. 251–252; Oct. 27, p. 269. Petroleum World, vol. 14, November, 1917, pp. 477–482. Abstract, Jour. Soc. Chem. Ind., vol. 37, March, 1918, p. 116A. Gives, in tabular form, with their specific gravities and boiling points, the classes of hydrocarbons which may be present in spirits from various sources. Discusses specific gravity tests and distillation tests, and compares the effect on two samples of benzine of different methods of carrying out the latter. Notes the gradual change in motor spirit corresponding to the development of the motor engine, and discusses the detection and determination of sulphur in motor spirit, with description of apparatus for that purpose.

See also Nos. 68, 637, 637a, 661, 666a, 696, 697, 701, 718, 1056, 1065, 1081, 1082, 1372.

LUBRICATING, TRANSFORMER, AND SWITCH OILS.

751. Copeland, C. W. Cutting oils: Their properties, composition, examination, and industrial application. Met. and Chem. Eng., vol. 17, July 1, 1917, pp. 25–32. Refers to compounded oils used in the metal-cutting industries, and includes mineral oils as constituents of the soluble cutting oils.

752. Evans, E. A. Chemistry and examination of lubricating oils. Electrician, vol. 78, Feb. 23, 1917, pp. 633–634. Abstract of paper before the Diesel Engine Users' Association. A discussion of the properties and composition of lubricating oils.

753. Gray, R. Oils and greases in common use. Am. Machinist, vol. 46, Jan. 25, 1917, pp. 145–146. General discussion of lubricants used in manufacturing.

754. Kauffman, J. L. Straight mineral oil versus compounded oil for the bearings of marine engines not having forced lubrication. Jour. Am. Soc. Naval Eng., vol. 29, February, 1917, pp. 48–32. Gives results of tests made at the engineering experiment station at Annapolis. Conclusions are in favor of straight mineral oil.

755. National Petroleum News. Maker of good core oil must know foundry practice. Vol. 9, July, 1917, pp. 60, 62. Discusses the requirements of core oil, and the use of mineral oils in compounding it.

756. Winston, H. T. Navy lubricants and lubrication. Jour. Am. Soc. Naval Eng., vol. 29, May, 1917, pp. 239–261. Discusses very fully the kinds, properties, tests, purchase, etc., of oils used as lubricants for machinery, and more briefly, the characteristics of lubricants for cutting tools, greases, graphite, and miscellaneous lubricants. An appendix gives specifications and tests of oils.

See also Nos. 68, 636, 639, 641–652, 654, 655, 681, 685, 689, 694, 710, 714, 715, 721, 724, 1015, 1436, 1437, 1450.

GAS AND FUEL OILS, ABSORPTION OILS, PETROLEUM RESIDUUMS.

757. Downing, R. C., and Pohlman, E. F. A study of gas oils. Proc. Am. Gas Inst., 1916 (published 1917), vol. 1, pp. 588–626; discussion, pp. 627–636. Am. Gas Light Jour., vol. 105, Nov. 13, 1916, pp. 318–319, 322–330. Discusses methods for their evaluation, and the results of cracking gas oils in atmospheres of various gases.

758. Harrington, Joseph. Oil and powdered coal as fuels. Power Plant Eng., vol. 21, Sept. 15, 1917, pp. 736–738. From paper before the International Railway Fuel Association. Discusses characteristics of these fuels, methods of burning, and comparative costs.

759. Shuttleworth, Lance. Benzene absorption oils in practice and analysis. Gas World, vol. 67, Sept. 1 1917. Coking and By-Products Section, p. 11. Discusses the efficiency and necessary properties in absorption oils, including petroleum oils.

See also Nos. 711, 723, 1035, 1049.

MONTAN WAX.

760. Marcusson, J., and Smelkus, H. (Montan wax and its behavior on distillation.) Chem. Ztg., Jahrg. 41, 1917, pp. 129–136. Jour. Soc. Chem. Ind., vol. 36, May 31, 1917, p. 540. Chem Abs., vol. 11, Dec. 10, 1917, pp. 3453–3454.

See also Nos. 4, 635, 657, 692.

ASPHALT, TARS, ETC.

761. **Adam, C. F.** Importance of inspection of paving materials. West. Eng., vol. 8, August, 1917, pp. 293–295. Relates facts in cases of inadequate inspection, and points out the economy of using more care in this respect.

762. **Hixson, A. W., and Hands, H. E.** Some relations of the effect of overheating to certain physical and chemical properties of asphalts. Jour. Ind. and Eng. Chem.,, vol. 9, July, 1917, pp. 651–655. Results of an investigation to determine to what extent an asphalt can be heated without altering those properties that are desirable for a durable pavement.

763. **Mabery, C. F.** Relations in composition of the different forms of bitumens. Jour. Am. Chem. Soc., vol. 39, September, 1917, pp. 2015–2027. Results of a study of the similarity between the distillation products of Ohio bituminous coal and a neighboring petroleum; between the constituents of Utah gilsonite and the heavy varieties of petroleum; and between the hydrocarbons derived from grahamite and those from gilsonite.

See also Nos. 4, 304, 684, 686, 688, 692, 706, 722, 736, 737, 738, 739, 967, 1408, 1410, 1415, 1416, 1417.

SHALES, MISCELLANEOUS SOLID BITUMENS, LAMPBLACK, AND COKE.

See Nos. 4, 6, 681.

MISCELLANEOUS (590).

764. **Charitschkov, K.** (Determination of free alkali in petroleum soaps.) Nephthanoje Djelo, 1916, No. 13. Chem. Ztg., Jahrg. 41, 1917, Rep., p. 102. Jour. Soc. Chem. Ind., vol 36, May 31, 1917, p 557. Chem. Abs., vol. 11, Oct. 10, 1917, p. 2737. The aqueous solution of soap is treated with copper sulphate or ferrous ammonium sulphate, the naphthenic acid dissolved in petroleum spirit, the residue of iron oxide or copper oxide determined, and calculated into the corresponding amount of free alkali.

765. **Reeve, C. S., and Lewis, R. H.** The effects of exposure on some fluid bitumens. Jour. Ind. and Eng. Chem., vol. 9, August, 1917, pp. 743–746. Gives in detail results of exposures of crude petroleum, oil asphalt, and petroleum residuum, concluding that polymerization and intermolecular reactions induced by heat, and possibly increased by the action of light, are largely responsible for the changes which occur, beside those due to simple evaporation.

REFINING AND REFINERIES (600).

PROCESSES AND PRACTICES (610).

766. Deppé, W. P. Solving the gasoline problem. Jour. Soc. Automotive Eng., vol. 1, December, 1917, pp. 353–359; discussion, pp. 359–362. Extracts in Automotive Industries, vol. 37, Nov. 29, 1917, pp. 971–972, and Nat. Petroleum News, vol. 9, Dec. 12, 1917, pp. 50, 52, 54, 56, 58, 60. Is a popular discussion of methods of refining oils in distillation plants; compares cracking reactions with carburation and combustion in internal-combustion engines.

767. Lindsly, B. E. Methods of producing gasoline. Min. and Oil Bull., vol. 3, May, 1917, pp. 135–140, 153–154, 157. Reviews various processes, including natural gas processes.

768. Rhead, T. F. E. Some sources of benzene and toluene for high explosives. Jour. Soc. Chem. Ind., vol. 36, July 31, 1917, pp. 764–768. Reviews the progress of investigation of the problem of making benzene and toluene from synthetic, catalytic, and electrical processes; from crude petroleums containing them in the uncombined state; from destructive distillation of coal; from thermal decomposition or "cracking" of petroleum.

769. Rittman, W. F. Need more efficient distillation methods. Nat. Petroleum News, vol. 9, July, 1917, pp. 38, 40. Emphasizes the need for closer study of distillation methods in order to obtain a maximum of products, particularly gasoline, from petroleum.

770. ——— Producing, refining, and cracking of petroleum. Evening Post Oil Industry Supplement, New York, Aug. 31, 1917, pp. 8–10. Considers the importance of petroleum and its products, the relation of supply and demand, the probable future supply of petroleum, distillation and cracking processes, chemical treatment after distillation, and the apparatus used.

See also Nos. 404, 405, 1041.

DEHYDRATING AND CLEANING (PATENTS).

771. Barnickel, W. S. Process and apparatus for treating crude oil. U. S. patents 1223659, 1223660, Apr. 24, 1917. Canadian patent 177653, June 19, 1917. Japanese patent 31181, June 13, 1917.

772. Dyer, E. I. Apparatus for dehydrating hydrocarbon oils. U. S. patent 1220504, Mar. 27, 1917.

773. Jensen, J. O. Apparatus for preparing crude oil for distillation. Canadian patent 179633, Oct. 9, 1917.

774. Prutzman, P. W. Apparatus for dehydrating oils. U. S. patent 1238331, Aug. 28, 1917.

775. Sepulchre, E. Separating liquids and solids. (Petroleum and water.) English patent 103670, Apr. 4, 1917. Application 1192, Jan. 24, 1917.

776. Sexton, W. A. Oil clarifying and dispensing apparatus. (Settling tank.) U. S. patent 1248730, Dec. 4, 1917.

777. White, F. G., and Barnhart, W. J. Oil treating device. U. S. patent 1242292, Oct. 9, 1917.

See also Nos. 800, 801, 807.

DISTILLATION OF LIQUIDS.

778. **Cross, Roy.** Heat absorbed in the distillation of crude oil. Oil and Gas News, vol. 2, No. 5, 1917, p. 13.

PATENTS.

779. **Aylsworth, J. W.** Process and apparatus for fractional distillation and condensation. U. S. patent 1250760, Dec. 18, 1917.
780. **Born, Sidney.** Petroleum distilling apparatus. U. S. patent 1234124, July 24, 1917.
781. **Burton, Grant.** Apparatus for producing and condensing distillate. U. S. patent 1238256, Aug. 28, 1917.
782. **Darier, G. E.** Distilling; treating liquids and gases. English patent 104163, Apr. 25, 1917. Application 17994, Dec. 14, 1916.
783. **Davis, J. T.** Apparatus for fractional distillation. U. S. patent 1218840, Mar. 13, 1917.
784. **Flatau, L. S.** Distilling apparatus. U. S. patent 1233771, July 17, 1917.
785. **Gallsworthy, Benjamin.** Still. U. S. patent 1234327, July 24, 1917.
786. **Hansen, Julius.** Still for mineral oil. Canadian patent 174736, Jan. 30, 1917.
787. **Herber, S. M.** Distillation of oil. U. S. patents 1227558, 1227559, 1227560, May 22, 1917. Apparatus and method.
788. **Hirt, L. E.** Method and apparatus for fractionating hydrocarbons. U. S. patents 1222402, Apr. 10, 1917; 1250879, Dec. 18, 1917.
789. **Kelsey, S. E.** Distillation apparatus for hydrocarbon liquids. Canadian patent 175339, Feb. 27, 1917.
790. **Kuhn, F. A.** Distilling petrol. English patent 102903, Feb. 21, 1917. Application 11306, Aug. 10, 1916.
791. **Landes, W.** Distilling petroleum. English patent 107502, Aug. 22, 1917. Application 14462, Oct. 11, 1916.
792. **Lummus, W. E.** Column for distillation. U. S. patent 1226898, May 22, 1917.
793. ——— Method of and apparatus for fractional distillation. U. S. patent 1216334, Feb. 20, 1917.
794. **Mitchell, J. E., and Morfey, H.** Dephlegmators. English patent 17567, Apr. 4, 1917. Application dated Dec. 16, 1915.
795. **Rosenbaum, R. R.** Apparatus for dephlegmation. U. S. patent 1222801, Apr. 17, 1917.
796. **Rowsey, G. L.** Apparatus for treating hydrocarbon oils. U. S. patent 1235384, July 31, 1917.
797. **Sadler & Co. and Bellerby, J.** Still for the fractional distillation of volatile liquids (e. g., crude benzol, etc.). English patent 105395, June 6, 1917. Application 5306, Apr. 11, 1916.
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See also Nos. 218, 1035, 1037.

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FRANKLIN K. LANE, SECRETARY
BUREAU OF MINES
VAN. H. MANNING, DIRECTOR

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BY

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ABSTRACTS OF CURRENT DECISIONS ON MINES AND MINING, JANUARY TO MAY, 1919.

By J. W. THOMPSON.

MINERALS AND MINERAL LANDS.

MINERALS.

MEANING OF TERM.

The term "minerals" when used in grants or in reservations or instruments of conveyance is not limited to metals or metalliferous deposits, whether contained in veins that have well-defined walls or in beds or deposits that are irregular and are found at or near the surface or otherwise.

Byron v. Utah Copper Co., —— Utah ——, 178 Pacific 53, p. 56.

The term "mineral" in its commercial sense has been defined as any organic substance found in nature having sufficient value separate from its situs as part of the earth to be mined, quarried, or dug for its own sake or its own specific use.

Rockhouse Fork Land Co. v. Raleigh Brick & Tile Co., —— W. Va. ——, 97 Southeastern 684, p. 685.

CONSTRUCTION AND MEANING.

It can not be said that the term "minerals" includes only such substances as are procured by tunnelling and shafting, as much gold is procured by placer mining and rich deposits of manganese and other like ores are found upon the surface of the earth and are sometimes obtained without either quarrying or mining.

Rockhouse Fork Land Co. v. Raleigh Brick & Tile Co., —— W. Va. ——, 97 Southeastern 684, p. 685.

GRANITE AS MINERAL.

It has been determined that granite was included in a grant of minerals.

Rockhouse Fork Land Co. v. Raleigh Brick & Tile Co., —— W. Va. ——, 97 South eastern 684, p. 685.

See Armstrong v. Lake Champlain Granite Co., 147 N. Y. 495, 42 Northeastern 186.

OIL A MINERAL.

Petroleum or mineral oil is within the meaning of the term "mineral" as it was used in the act of Congress (act of July 27, 1866, 14 Stats. 292) reserving mineral lands from railroad land grants.

Cheino Land & Water Co. v. Hamaker, —— Cal. App. ——, 178 Pacific 738, p. 739

OIL AND GAS—NATURE—CONSTRUCTION OF CONTRACT.

Oil and gas are furtive, migratory and self-transmissive minerals, and because of these characteristics or qualities contracts and rights relating thereto require the application of principles different in many respects from those applicable to other minerals that are not affected with such characteristics.

Rechard v. Cowley, —— Ala. ——, 80 Southern 419, p. 420.

SUBSTANCES DEFINED AS MINERALS.

It has been variously held by courts that stone used for road making and paving, limestone, flintstone, slate, clay, and other like materials are minerals. But the determination may depend upon the language used by the parties in the grant as reflecting their intention.

Rockhouse Fork Land Co. v. Raleigh Brick & Tile Co., —— W. Va. ——, 97 Southeastern 684, p. 685.

ORES REMOVED BY COTENANT—DUTY TO ACCOUNT—LIABILITY.

It is the duty of a coowner of a mining claim to keep the ore mined from the joint claim separate from other ore, and to keep an account of the ore mined and of its proceeds, and promptly to account for and pay to the coowner his just share of the proceeds. Failing to do this the operating coowner can receive no profits from his wrongful treatment of the ore and the other coowner is entitled to receive the just value of his property and its income. If in an action to account the issues are rendered uncertain or doubtful by reason of the failure of the mining coowner to discharge his duties or by his confusion of the ores mined from the joint claim with those mined by him from other sources, then the issues must be resolved against the wrongdoer.

Silver King Coalition Mines v. Conklin Min. Co., 255 Federal 740, p. 743.

SHIPMENT OF ORE—LIABILITY OF CARRIER—DUTY OF CARRIER TO DELIVER TO OWNER.

A railroad company as a common carrier received and shipped a certain quantity of ore. Before the ore was received for shipment the alleged real owner notified the railroad company that the ore would be tendered for shipment, but that it had been stolen and was in fact his property. Ordinarily, a common carrier is guilty of no conversion where it receives property from one not rightfully entitled to possession and, acting as a mere conduit, delivers the property in pursuance of the bailment if this is done without notice. But if a carrier has received notice of the rightful ownership of the goods its status is altered and it acts at its peril. It was the duty of the carrier to deliver the ore to the rightful owner and the performance of that duty will not be adjudged to be tortious as against a bailor having no title. The delivery of the ore to the rightful owner would be a complete defense in an action by the wrongful bailor against the carrier.

Dixon v. Southern Pacific Co., —— Nev. ——, 177 Pacific 14 (rehearing).

See Dickson v. Southern Pacific Co., —— Nev. ——, 172 Pacific 368. (Bulletin 172, p. 6.)

ORE—SHIPMENT—LIABILITY OF CARRIER—DESCRIPTION OF ORE—WAIVER.

The owner of certain ore notified a railroad company that a quantity of ore would be delivered to it for shipment by a third person, and further notified the company that the ore had been stolen and that it was in fact his property. The company declared its intention pursuant to its common law duty to ship the ore if properly offered. When the ore was offered for shipment the railroad company required and received an affidavit from the possessor to the fact that he was the real owner and thereupon shipped and delivered the ore according to his order. In an action by the real owner against the carrier for conversion and for damages the railroad company could not defend on the ground that the description of the ore was too indefinite and uncertain to charge it with knowledge of the rights of the real owner. The avowal of the company to ship the ore if tendered and basing its decision on its legal rights rather than upon the indefinite description of which it made no complaint at the time, the company waived the right to insist that the description of the ore was too indefinite and uncertain to charge it with knowledge of the real owner of the ore.

Dixon v. Southern Pacific Co., —— Nev. ——, 177 Pacific 14, p. 16. (Rehearing.)

REMOVAL OF MINERALS—CONTEMPT OF COURT.

In an action of trespass for mining and removing minerals a witness can not be adjudged guilty of contempt of court for refusing to answer immaterial questions, but he may be adjudged in contempt of court and punished for refusing to answer an inquiry as to how much gold he had seen the defendant and his employees clean up, as the question was directly pertinent to the issue.

Kimball v. Superior Court, —— Cal. App. ——, 177 Pacific 488.

MINGLING GOLD WITH GOLD-BEARING ORE—INDICTMENT—FRAUD.

An indictment charged that the accused willfully and unlawfully and feloniously mingled gold with samples of gold-bearing ore taken from a test hole on placer ground and did thereby change the value of the gold-bearing ore with intent to deceive and defraud certain named persons. The indictment followed the Arizona statute and the offense is purely statutory and the time, place, and circumstances are stated with certainty, and an indictment is sufficient when it describes the offense substantially in the language of the statute.

Martinez v. State, —— Ariz. ——, 176 Pacific 582, p. 583.

MINERAL LANDS—SALE AND CONVEYANCE.

CONSTRUCTION OF DEED—MINERALS INCLUDED.

A deed conveying mineral lands granted the privilege to use so much of the stone and water as might be necessary or desirable for the operation of a coal mine or mineral plant, including the right to enter upon the land, mine, excavate, and remove the coal and to make and maintain roads, excavations, ways, shafts, drains, and openings necessary and convenient for mining coal and other minerals, and the rights and privileges to run with the coal and minerals. Under this grant it is clear that it was within the contemplation of the parties that the minerals granted were such as it was necessary to mine either by tunnel or by sinking shafts and the conveyance is limited to such minerals as may be secured by the ordinary process of mining. As against this grant a subsequent purchaser of the surface had the right to dig and remove a seam of clay valuable for the purpose of manufacturing brick, though such seam of clay was not a part of the soil used for agricultural purposes. The seam of clay was held not to be within the terms of the mineral grant.

Rockhouse Fork Land Co. v. Raleigh Brick & Tile Co., —— W. Va. ——, 97 Southeastern 684, p. 686.

OPTION AGREEMENT TO PURCHASE.

An option or a contract to purchase certain mineral lands provided for the payment of a stated sum on or before a certain fixed date. There was no valid offer to perform the agreement and there was nothing to show that the purchaser was able to perform and pay the amount stipulated before or at the date named and the purchaser was in no position to compel a performance of the contract where he himself had failed to perform his part.

Langan v. Marriposa Commercial & Min. Co., —— Cal. App. ——, 178 Pacific 166, p. 168.

OPTION TO PURCHASE—INTEREST OF WIFE.

A husband procured an option to purchase certain valuable mineral lands and his wife contributed of her separate funds a large proportion of the sum paid for the option. Subsequently a corporation was formed that took over the option and stock was issued to the incorporators. Certain shares of stock were issued to the agent and attorney of the wife to be held until a certain sum due her from the corporation was paid. Under these facts a creditor of the husband could not compel the transfer of the stock of the husband in payment of his debts on the ground that it had been fraudulently transferred by the husband to the wife in fraud of his creditors. The fact that the option to purchase the mining property was taken in the name of the husband did not make it his property where the wife contributed of her separate funds a large share of the purchase price and where subsequently the stock was issued to the agent of the wife in part payment of the sum paid by her on the option purchase.

Farish v. Beeby, —— Ariz. ——, 179 Pacific 51.

OPTION TO PURCHASE—SERVICES RENDERED OPTIONEE—LIABILITY OF WIFE OF OPTIONEE.

A husband procured an option contract to purchase valuable mineral lands. While holding the option a mining engineer employed by him examined and reported on the property described in the option and his report induced the organization of a corporation that took over the option and finally purchased the property. The wife of the optionee contributed from her separate funds a large part of the purchase price of the option and stock of the corporation was thereafter issued representing her investment. The wife could not be held liable for the services of the mining engineer on the ground either that his services contributed to the value of her holdings or on the ground that she was estopped in failing to notify the mining engineer that she had contributed of her separate funds to help pay for the option. It could not be assumed that the mining engineer relied upon the inchoate and uncertain interest of the husband, a mere option upon unpatented and unpromising mining claims, for his compensation in experting the mine.

Farish v. Beeby, —— Ariz. ——, 179 Pacific 51, p. 52.

DISCLAIMER AS A CONVEYANCE.

Pending certain actions of ejectment and to quiet title to land a former owner of part of the land who was still in possession of other parts, in consideration of being released from all litigation to the particular tract of which he held possession, executed a writing whereby he disclaimed all right, title, claim, demand, or interest in and to certain described parts of the land in controversy. Under the statute of West Virginia the disclaimer was in effect a quitclaim deed and in equity it was a contract by which the disclaimant relinquished all interest in the land and authorized the party claiming title to do what he chose with the land.

Woodall v. Clark, 254 Federal 526, p. 533.

LIMESTONE NOT INCLUDED IN MINERALS.

In a sale and conveyance of minerals the language of the deed making the grant may show that the parties only intended such minerals as were secured by the ordinary process of mining, and such a conveyance may not include limestone as mineral.

Rockhouse Fork Land Co. v. Raleigh Brick & Tile Co., —— W. Va. ——, 97 Southeastern 684, p. 685.

See Brady v. Smith, 181 N. Y. 178, 73 Northeastern 963.

FRAUDULENT PURCHASE BY AGENT.

Certain mining property, with an operating mine, was owned by several persons as partners. On the death of one of the partners his widow inherited his entire interest. One of the other partners for many years had been the manager of all the mining operations and was familiar with the workings and knew something of its possibilities. The widow had had no practical experience in mining and was less competent to form an intelligent opinion or to speculate upon the ultimate value of the property than was the managing partner; but she was intelligent and familiar with business methods and with mining property generally and had an intelligent comprehension of the conduct of the mining operations and the revenues received from the mine. The managing partner after explaining truthfully and in detail the status of the property and after advising the widow of what had been done and what they were planning and expecting to do made, at her request, an offer for her interest. After consulting with other of the partners and after inducing the managing partner to increase his offer she sold her interest for $350,000. The fact that the mining property together with the smelting enterprise in which the partners engaged subsequently proved more profitable than was anticipated at the time of the sale will not justify a rescission of the sale on the ground that the managing partner failed to make full and fair disclosures of the mining conditions.

Cardoner v. Day, 253 Federal 572, p. 577.

RAILROAD GRANT—EXCEPTION.

A patent to the Southern Pacific Railroad Company duly issued by the proper authorities contained a clause "reserving all claim of the

United States to the same as mineral land." A patent upon collateral attack is a conclusive and official declaration that the land is agricultural and that all the requirements preliminary to the issuance of the patent have been complied with. The reservation and exception contained in the patent to the railroad company excepting mineral lands is a void exception. Persons not in privity with the Government in any respect at the time the patent was issued to the railroad company can not successfully attack the patent.

Cheino Land & Water Co. v. Hamaker, —— Cal. App. ——, 178 Pacific 738, p. 739.
See Burke v. Southern Pacific R. Co., 234 U. S. 669, 34 Supreme Ct. Rep. 907.

DEED A MORTGAGE.

The owner of mineral lands conveyed the land by a deed to secure the grantee for a sum of money advanced by him to the grantor and under an agreement that the grantee should organize a corporation of a stated capital stock to take over the mineral lands and the grantee to hold 51 per cent and the grantor to hold 49 per cent of the capital stock of the corporation. On the failure of the grantee to organize the corporation the grantor brought suit to quiet the title and to have the deed canceled and set aside. Under the facts the grantor was not entitled to have the deed canceled and set aside and the title quieted, but the grantee was entitled to have the deed declared to be a mortgage to secure the sum advanced and to foreclose it accordingly.

Dunbar v. Morajeska, —— Ariz. ——, 178 Pacific 777, p. 779.

TRUST—ACTION TO COMPEL RECONVEYANCE—TWO-WITNESS RULE.

In an action by a wife to compel her husband to reconvey mineral lands held by him in trust for her, the two-witness rule does not require that every detail of the testimony of one witness must be verified by the direct evidence of another; but the rule has no application where the husband by his own testimony destroyed the absolute character of the deed and admitted that it was not intended to be an absolute conveyance.

Morrish v. Morrish, —— Pa. ——, 105 Atlantic 83, p. 85.

MINING PROSPECTS—MARKET VALUE.

Mining properties as such have no market value. The value lies not in a certainty of a return or a fair interest or income but in dreams and hopes. They are merely tables upon which cards are turned and courts are not disposed to hold that a prospect which was the subject matter of a contract was a borrowing asset.

Wilson v. Mears, —— Wash. ——, 177 Pacific 815, p. 818.

SURFACE AND MINERALS—OWNERSHIP AND SEVERANCE.

RESERVATION OF MINERALS—MINING OPERATIONS.

A landowner by deed conveyed to a copper company certain described land but reserved the right to all ores in and underneath the surface together with the right to mine and remove the same; but provided that the mining operations should not endanger buildings or improvements then or thereafter erected on a certain described portion of the surface, by reason of sinking or caving of the surface of such area caused by mining operations. At the time of the conveyance it was known that valuable copper ore had been found and was contained at and immediately under the surface area of the land conveyed and that mining operations had been carried on by employing surface as well as underground methods of mining, and that the method generally adopted for mining low grade copper ore was by taking and removing all the material from the surface downward and that such surface mining was the practical and more economic method and the only method of mining the ore at or immediately underneath the surface of the ground. By the conveyance the purchaser relinquished and waived all right to subjacent support to the surface except as to a small rectangular strip. After the conveyance the copper company, the purchaser, excavated the rectangular strip for the purpose of erecting buildings thereon and removed the material so excavated to other portions of the premises conveyed and there deposited the same in dumps. The materail removed and stored contained copper ore of economic and commercial value. Thereafter the original grantor as the owner of the minerals reserved gave a third person a mining lease for the mineral so reserved. Under such lease the lessee and his assigns had the right to carry on the business of mining in and underneath the surface of the demised premises excepting only such rectangular strip, and had the right to remove the ore contained in the material so removed by the copper company, and were entitled to an injunction restraining the copper company from in any manner interfering with or molesting the lessee or his assigns from mining and removing the ores and minerals in and underneath the surface of the premises including the ores contained in the dumps made by the copper company.

Byron v. Utah Copper Co., —— Utah ——, 178 Pacific 53, p. 54.

COAL AND COAL LANDS.

COAL IN PLACE—SUBJECT TO MORTGAGE OF LAND.

Coal in place is part of the real estate and is covered by a mortgage duly executed by the owner of the land and coal.

Reisinger v. Garrett Smokeless Coal Co., —— Pa. ——, 106 Atlantic 78, p. 79.

CONTRACT FOR DEED AND DEED—MERGER.

The owner of 167 acres of coal land gave an option agreement to purchase all the coal within the entire tract, the optionee to pay a stated price per acre with the privilege of electing the part of the tract and the number of acres to be conveyed and paid for. The optionee after due inspection elected to purchase and pay for 150 acres and a deed for the same was duly executed by the landowner and accepted by the optionee. The execution of the deed merged the contract to purchase and the rights of the purchaser were limited to the land described in the deed accepted by him.

Titus v. Poland Coal Co., —— Pa. ——, 106 Atlantic 90, p. 93.

GRANT OF RIGHT TO MINE AND REMOVE COAL—EXTENT OF GRANT.

A deed conveyed coal to the grantee together with the right to mine and remove the coal and with the necessary mining rights together with the right to remove and carry away "under said described premises" other coal of the grantee. The word "under" as used in grant must be accepted in its ordinary sense and can not be enlarged so as to be deemed to grant the right to carry and transport coal over the surface of the land as well as underneath it. The carrying of coal from adjacent tracts underneath the surface would occasion the grantor no inconvenience and would not interfere with the enjoyment of the surface rights. The grantor reserved to himself the surface rights and obviously had no purpose of giving the grantee any rights in the surface except such as were necessarily incident to the enjoyment of the right to remove the coal underneath the particular tract.

Shaulis v. Quemahoning Creek Coal Co., —— Pa. ——, 105 Atlantic 826, p. 827.

MORTGAGE AND LEASE—PRIORITY—WAIVER.

The owner of certain coal lands executed a mortgage covering the entire estate in the land and coal. A purchaser of the land subject to the mortgage executed a coal lease and the mortgagee for a sufficient consideration waived his right of priority and agreed that the coal lease should be superior to the lien of his mortgage. This agreement was recorded in the deed book but not in the mortgage book. Subsequently the land was sold to satisfy the mortgage, but the coal lessee was in possession and had knowledge of the sale, but gave no notice and made no claim of the priority of his lease. Under these facts the purchaser at foreclosure sale without notice or knowledge of the agreement to make the lease a prior lien, acquired the entire estate in the land and the coal and obtained thereby the right of possession of the entire premises.

Reisinger v. Garrett Smokeless Coal Co., —— Pa. ——, 106 Atlantic 78, p. 79.

OPTION TO PURCHASE—ELECTION—LIMITATION ON RIGHTS.

The owner of certain coal lands gave an option agreement to another by which he agreed to sell the nine-foot vein of coal and all coal, with a nominal exception, in and under the land described. The grantee of the option agreed to pay a certain price per acre for every acre of the nine-foot vein of coal as should be determined by the engineer of the purchaser. The option contract included 167 acres but the optionee elected to take only 150 acres, and by this election his mining rights were limited to the 150 acres and he could not exercise any mining rights on the remaining 17 acres not included in his deed.

Titus v. Poland Coal Co., —— Pa. ——, 106 Atlantic 90, p. 92.

DISCLAIMER AS TO MINERAL RIGHTS.

A landowner for a sufficient consideration expressly disclaimed all title or interest in all coal, except so much as should be required for domestic purposes and all iron ore, natural gas, and all other minerals in, upon, or under the tract of land described, with the exclusive right for rights of ways for tram, rail, and wagon roads through the land and to dig for and mine coal, iron ore, bore for oil or natural gas, and the necessary conveniences on the land for storing oil and coal. This disclaimer sufficiently shows the title to the minerals to be in the person in whose interest the disclaimer was given.

Woodall v. Clark, 254 Federal 526, p. 532.

OWNERSHIP OF CULM—PRELIMINARY INJUNCTION—RIGHT OF APPEAL.

A landowner averring ownership and possession of a culm bank containing over 170,000 tons and located on the surface of his lands is entitled to a preliminary injunction restraining a third person from entering upon his premises and removing the culm, especially where it was averred that the defendant and his employees had wrongfully and forcibly entered upon the premises and removed a large quantity of the culm and that he threatened to continue to do so and forcibly to eject the plaintiff and his servants; and where it was also averred that the plaintiff had no adequate legal remedy in that the defendant was financially unable to respond in damages.

Holden v. Llewellyn, —— Pa. ——, 105 Atlantic 639, p. 640.

SALE OF INCUMBERED PROPERTY—ASCERTAINMENT OF RENTS.

A court before decreeing the sale of trust property consisting of coal lands and a producing coal mine should ascertain by reference to a commissioner or by an express finding based upon the pleadings and the facts disclosed whether the rents and profits will be sufficient to pay and discharge the lien indebtedness within the period specified in the lien or mortgage.

Abney-Barnes Co. v. Davey-Pocahontas Coal Co., —— W. Va. ——, 98 Southeastern 298, p. 302.

SALE TO JUSTIFY LIENS—APPLICATION OF PROCEEDS OF MINE.

The operations of a coal mine on a trust estate resulted in the accumulation of $95,000. While this fund was under the control of the court the mortgagees and crditors sought by a decree of foreclosure to enforce payment of trust liens and a mortgage by the sale of the incumbent mining property by reason of overdue and unpaid interest coupons. This fund in the treasury of the court and under its control arose out of the trust property and was a part of it and as such was subject to the payment of the liens binding the property and should have been applied to reduce the incumbrance before decreeing the sale of the land.

Abney-Barnes Co. v. Davey-Pocahontas Coal Co., —— W. Va. ——, 98 Southeastern 298, p. 303.

SHERIFF'S SALE—VALIDITY—BID INCREASED.

Certain coal lands were sold at a sheriff's sale for $4,325. Subsequently a third person filed a paper setting forth that on a resale he would open the bidding at $5,500. Thereupon by agreement of the parties the original purchaser increased his bid to $5,500 and the sheriff was permitted to amend his return and award the property to the purchaser. Later another person filed a paper making a conditional offer of $7,000. Under these facts and considering the nature of the conditional offer the sale to the original purchaser at his increased bid was properly confirmed.

Nutt v. Berlin Smokeless Coal & Clay Min. Co., —— Pa. ——, 105 Atlantic 627, p. 628.

ASSESSMENT FOR TAXATION.

Coal lands surrounding a proven mine, although in a prospective state only, may be given an assessed valuation for the purpose of taxation, where the taxing officers find and believe that the property has coal value.

Washington Union Coal Co. v. Thurston County, —— Wash. ——, 177 Pacific 774, p. 775.

OIL AND OIL LANDS.

OIL AND GAS AS MINERALS.

Petroleum oil and gas are included within the term "minerals."

Rockhouse Fork Land Co. v. Raleigh Brick & Tile Co., —— W. Va. ——, 97 Southeastern 684, p. 685.

OIL AND GAS IN PLACE—OWNERSHIP.

Oil and gas are not capable of distinct ownership in place.

Rich v. Doneghey, —— Okla. ——, 177 Pacific 86, p. 95.
See Daughetee v. Ohio Oil Co., 263 Ill. 518, 105 Northeastern 308.

NATURE AND OWNERSHIP.

The owner of land has the qualified ownership of the oil and gas therein and an exclusive right, subject to legislative control against waste and the like, to erect structures on the surface of the land and explore therefor by drilling wells through the underlying strata and to take and reduce to possession and thus acquire absolute title as personal property to such oil and gas as may be found and obtained thereby.

Rich v. Doneghey, —— Okla. ——, 177 Pacific 86, p. 89.

OWNERSHIP—SALE.

The right of a landowner to drill and explore for gas and oil and to reduce the same to possession is a right that is the proper subject of sale and may be granted or reserved. The right so granted or reserved, and held separate and apart from the possession of the land itself, is an incorporeal hereditament or, as designated in the ancient French, a profit a prendre, analogous to a profit to hunt and fish on the land of another. This right may be granted to another as an interest in fee; but an interest of less duration may be granted and that for a term of years is a chattel real and is an interest in the land.

Rich v. Doneghey, —— Okla. ——, 177 Pacific 86, p. 89.

CONVEYANCE—CONDITION—EXPRESSION OF PURPOSE.

A landowner conveyed by deed to the proper school authorities a certain described tract of land "for school purposes only." The deed conveyed to the school authorities a perfect title in fee and was sufficient to authorize the school authorities to lease the tract for oil and gas purposes.

T. W. Phillips Oil & Gas. Co. v. Lingenfelter, —— Pa. ——, 105 Atlantic 888, p. 889.

GRANT—TITLE AND ESTATE.

Grant of oil and gas in situ does not vest title thereto, or any estate therein or pass anything which can be the subject of ejectment or other real action.

Rich v. Doneghey, —— Okla. ——, 177 Pacific 86, p. 95.

PURCHASE OF UNDIVIDED INTEREST BY LESSEE—MERGER.

A lessee of certain oil and gas lands subsequently acquired the title to the undivided one-half interest in the leased premises. This did not result in a merger of the estates as such only could be the result by agreement of the parties and not by mere operation of law. Where the terms created for a special purpose, not yet accomplished, were to be kept separate until that object was effected, then equity considers them distinct.

Patterson v. United Natural Gas Co., —— Pa. ——, 105 Atlantic 828.

CONTRACT TO DRILL WELL—RECOVERY OF PRICE.

A contract for drilling an oil well required the operator to drill a well into the oil sand or to a depth of 3,500 feet if required by the landowner. Payments were to be made sixty days after the perforating casing was carried into the oil sand or to 3,500 feet. The driller can not recover the price for drilling a well 3,215 feet deep in the absence of proof that the other party accepted the well at that depth and in the absence of proof that the well was drilled into the oil sand.

California Well Drilling Co. v. California Midway Oil Co., —— Cal. ——, 177 Pacific 849, p. 851.

CONTRACT TO DRILL WELL—VALUE OF SERVICES—CONTRACT PRICE.

An oil company contracted with oil well drillers to drill a well at $1.50 per foot. Pursuant to the contract the well was drilled something over 2,000 feet when gas was encountered and by reason of the failure of the oil company to furnish a sufficient packer to shut off the gas, according to the contract, the work of drilling was delayed and the oil company wrongfully prevented the drillers from completing the well or to give them an opportunity to drill another well near the same location. In an action by the drillers to recover the value of their services, it was proper to estimate the value of the work performed by the contract price per foot, in the absence of evidence showing that the application of this rule was unfair.

Elwood Oil & Gas Co. v. McCoy, —— Okla. ——, 179 Pacific 2, p. 4.

CONTRACT TO DRILL WELL—CUSTOM—PERFORMANCE PREVENTED.

An oil company contracted with drillers to drill an oil well at $1.50 per foot. It was not contemplated by the contract that either party should prevent performance by the other. The oil company, pursuant to a prevailing custom, furnished, the rig to be used in drilling, and it was its duty to furnish the packer to shut off any gas that might be encountered. In the process of drilling, gas in large quantities was encountered, and a packer was furnished, but it failed to work and the oil company directed the drillers to draw the casing to determine other methods to shut off the gas. The drillers removed all but one piece of casing, and in attempting to remove this the crown block upon the rig broke, causing the casing to "telescope." Other efforts were made by the drillers under the direction of the oil company to remove the casing. The oil company finally demanded of the drillers that they complete the well within five days or remove their tools. The drillers continued their efforts for more than 30 days to remove the casing, when the oil company demanded that they remove their tools from the premises and cease operations, and the company went upon the premises and removed the drillers' tools from the rigs and from the premises. The evidence tended to show that the drillers could have removed the casing in a short time and that it was possible to drill by the casing. They were given no opportunity to drill another well near the same location. The fact that the oil company wrongfully prevented the oil drillers from performing their agreement entitled them to recover the value of the services rendered.

Elwood Oil & Gas Co. v. McCoy, —— Okla. ——, 179 Pacific 2, p. 3.

CONTRACT TO DRILL—DIFFICULTIES ENCOUNTERED—RIGHTS OF DRILLER.

An oil company employed a driller to drill an oil well. The oil company furnished the rig, according to a custom, and was to furnish a packer to shut off gas if encountered. At a depth of something over 2,000 feet gas was encountered and the packer furnished by the company was insufficient to stop the flow of gas. In attempting to draw the casing as directed by the oil company a piece of the casing was telescoped or hung up and the driller worked for more than 30 days in attempting to remove the piece of casing. The evidence showed that the driller had succeeded in removing the top of the casing to a point where he could insert a "bell socket" and was waiting for a tool of this kind, and the evidence showed that in a great majority of like cases the casing was removed. The oil company demanded that the driller remove his tools from the rig and leave the premises, and later itself, by its agents, removed the driller's tools from the rig and the premises. The law is that when one party to a contract becomes involved in difficulties not occasioned by his fault, the other party may not assume that he will be unable to continue and thereby deprive him of the opportunity to complete the contract and prevent him from recovering the value of the services performed. The driller had the right, if he was unable to recover the casing, to drill a new well, and there was nothing in the contract which prevented this if the first well failed. The rule is where one party can show that the other prevented performance of the contract, it will usually be taken as prima facie true that the first party would have performed his part of the contract had he not been thus prevented. The oil company had no right to assume that the driller would not recover the casing, and if he did not, prevent him from drilling a new well.

Elwood Oil & Gas Co. v. McCoy, —— Okla. ——, 179 Pacific 2, p. 4.

OIL WELLS—STATUTE PROHIBITING DRILLING NEAR RAILROADS—VALIDITY.

The statute of Kansas (General Statutes, 1915, sec. 4979) making it unlawful to drill or operate oil and gas wells within 100 feet of the right of way of any steam or electric railway is not unconstitutional and is a proper exercise of the police power of the State.

Winkler v. Anderson, —— Kan. ——, 177 Pacific 521, p. 522.

INSPECTION OF OIL—AUTHORITY OF OFFICER.

An oil inspector appointed under the invalid act of 1901 (Burns, 1914, sec. 7980) is not a de facto officer and has no power or authority as against an oil inspector duly appointed under the valid act of 1891.

Felker v. Caldwell, —— Ind. ——, 121 Northeastern 538, p. 539.

INSPECTION LAWS—PURPOSE, AND VALIDITY—INSPECTION FEES.

A State may in the exercise of its police power enact inspection laws for the inspection of oils, and these are valid if they tend in a direct and substantial manner to promote public safety and welfare or to protect the public from frauds and impositions as to which Congress has made no conflicting regulations. The State may also provide for a fee reasonably sufficient to pay the cost of such inspection although it probably may be moving in interstate commerce when inspected.

Pure Oil Co. v. State of Minnesota, 39 Supreme Ct. Rep. 35, p. 37.

OIL INSPECTION—REASONABLE INSPECTION FEES—PRESUMPTION.

Fees for inspection of oil and gas as determined by a legislature must be regarded as prima facie reasonable, and courts will not enter into nice calculations as to the difference between cost and collection; nor will they declare the fees to be excessive unless it is made to clearly appear that they are obviously and largely beyond that needed to pay for the inspection service.

Pure Oil Co. v. State of Minnesota, 39 Supreme Ct. Rep. 35, p. 37.

TRANSPORTATION—INTERSTATE COMMERCE.

The transportation of oil or gas from State to State through the medium of pipe lines is commerce between the States.

Pennsylvania Gas Co., In re, —— New York ——, 122 Northeastern 260, p. 261.
Public Utilities Commission of Kansas v. Landon, —— U. S. ——, 39 Supreme Ct. Rep. 389.

REGULATIONS BY STATE—CONTINUING POWER TO REGULATE.

A State may by statute regulate the sale and storing of petroleum and gasoline in dangerous quantities and may prohibit the storing of these oils within 300 feet of a dwelling in a city. The fact that an oil company removed its storage plant from a former to a less dangerous situation at the request of the municipality does not import a contract not to legislate further if the public welfare required it.

Pierce Oil Corp. v. City of Hope, 39 Supreme Ct. Rep. 172, p. 173.
See Pierce Oil Corp. v. City of Hope, 127 Ark. 38, 191 Southwestern 405.

ESCAPING OIL—LIABILITY.

The negligent discharge of oil into a stream was regarded as the proximate cause of fire resulting therefrom, rendering the owner of the oil liable in damages to the injured person. The liability exists, according to a majority of the cases, although the fire was started by the independent or careless act of a stranger.

Northup v. Eakes, —— Okla. ——, 178 Pacific 266, p. 269.
See Santa Rita (The), In re, 176 Federal 890.
Kuhn v. Jewett, 32 N. J. Equity 647.
Brennan Construction Co. v. Cumberland, 29 App. D. C. 554.
Rock Oil Co. v. Brumbaugh, 59 Ind. App. 640, 108 N. E. 260.
Texas Co. v. Clarke & Co., —— Tex. Civ. App. ——, 182 Southwestern 351.

SHIPPING OIL—LOSS OF OIL TRUCK—LIABILITY.

An oil company agreed to furnish to the owner of a boat oil for fuel to be delivered on board the vessel. The boat owner guaranteed "proper unloading facilities and access to dock." The oil truck delivering the oil was unloaded by backing onto an apron connecting the wharf and the boat and this was supplied and adjusted by the boat owner. Many truck loads of oil had been so unloaded, but at one time in the process of backing the truck onto the apron the apron gave way and the truck was lost in the sea. The boat owner was liable in damages for the loss of the truck under his guarantee of loading facilities and without regard to the effect of the tides on the boat or the apron.

Union Oil Co. v. Rideout, —— Cal. App. ——, 177 Pacific 196, p. 199.

NATURAL GAS.

RATES AND EFFICIENCY—DEDUCTION FOR INEFFICIENT SERVICE.

The Corporation Commission of Oklahoma established a maximum rate for natural gas based upon the adequacy of the service and the quantity of gas furnished. A pressure of four ounces or more was considered 100 per cent efficient as a basis for the maximum rate. As the pressure decreased the per cent of efficiency was decreased and the rates charged were to be reduced as the efficiency in pressure was reduced. The Commission has power to compel a gas company to reduce its rates by discounting its bills for the months when the efficiency was reduced if the discount ordered bears a fair relation to the falling off in efficiency.

Nowata County Gas Co. v. State, —— Okla. ——, 177 Pacific 618, p. 619.

REGULATION OF RATES—INTERSTATE COMMERCE.

The act of Congress regulating commerce (34 U. S. Stats. 584, 36 U. S. Stats. 539) expressly excepted gas and water companies and this permits the State of New York through its public service commission to regulate the distribution and to protect consumers against unreasonable charges for natural gas although the gas be transported through a pipe line from the State of Pennsylvania into the State of New York.

Pennsylvania Gas Co., In re, —— N. Y. ——, 122 Northeastern 260, p. 262.

TRANSPORTATION AND REGULATION—INTERSTATE COMMERCE.

The transportation of gas through pipe lines from one State to another is interstate commerce; and as a part of such commerce a receiver of a gas company may sell and deliver gas so transported to local distributing companies free from unreasonable interference by the State.

Public Utilities Commission of Kansas v. Landon, —— U. S. ——, 39 Supreme Ct. Rep. 389.

LOCAL COMPANIES—REGULATIONS—INTERSTATE COMMERCE.

Local gas companies received natural gas from a producing and transporting company with which they supplied their customers at various places. The fact that the distributing companies paid the producing and transporting company sums amounting to two-thirds of the product of their sales did not make them integral parts of the interstate commerce of the producing and transporting company and did not prevent them from being subject to regulations by local public utilities commissions.

Public Utilities Commission of Kansas v. Landon, —— U. S. ——, 39 Supreme Ct. Rep. 389.

PUBLIC LANDS.

BOARD OF EDUCATIONAL LANDS—JURISDICTION.

The Board of Educational Lands has no jurisdiction or control over the disposal of saline lands, as such lands granted by the enabling act to the State were not placed in the class of educational lands by the constitution.

Chicago, etc., R. Co. v. Neville, —— Nebr. ——, 170 Northwestern 176.

AGRICULTURAL AND MINERAL ENTRYMEN—PREFERENCE.

An agricultural entry made on the public lands under the act of June 11, 1906 (34 U. S. Stats. at Large 233), and approved by the Department of Agriculture under that act as against a subsequent mineral applicant seeking to have the land restored to the public domain, must prevail and must be held to be the prior and superior title and interest in and to the land, where the land was shown to be more valuable for agriculture than for mineral, and where the mineral discovery consisted only of a few colors of gold found in the beds of the water courses on the land.

Meyers v. Pratt, 255 Federal 765, p. 766.

EMINENT DOMAIN.

APPROPRIATION OF PROPERTY—COMPENSATION TO OWNER.

The constitution of Kentucky (Section 242) requires corporations and individuals invested with the privilege of taking private property for public use to make just compensation for the property taken, injured, or destroyed. Under this mandatory provision of the constitution a railroad company wrongfully appropriating lands and its successor may be liable for injury done to the remaining land in cutting off and destroying the ingress and egress to such remaining part of the owner's land.

Hazard Dean Coal Co. v. McIntosh, —— Ky. ——, 209 Southwestern 364, p. 366.

APPROPRIATION OF LAND—BURDEN OF PROOF AS TO USE.

In appropriation proceedings by a natural gas company to obtain land for a right of way for its pipe line, the burden of proof is on a landowner to show, as contended by him, that the land is to be devoted not to a public but to a private use.

Pittsburgh & West Virginia Gas Co. v. Cutright, —— W. Va. ——, 97 Southeastern 686, p. 688.

LAND FOR GAS PIPE LINE—INCIDENTAL USE—MANUFACTURING GASOLINE.

A natural gas company organized to transport and supply the public with natural gas is not to be denied the right to appropriate land for a right of way for its pipe line because one of its objects and purposes is to gather the gas at its compressor station from many sources and the gas is to be piped through lines laid on the land proposed to be taken is first to be passed through the condensing or gasoline plant and the gasoline and other liquid substances extracted before emitting it in and through its service pipes and by the compressor driven to the market; nor from the fact that these operations make it necessary to lay down two lines of pipes, one to carry the gas in its natural state into the gasoline or condensing station and the other to pass it out and on through the main discharge line to the consumers.

Pittsburgh & West Virginia Gas Co. v. Cutright, —— W. Va. ——, 97 Southeastern 686, p. 687.

PIPE LINE FOR NATURAL GAS—INCIDENTAL USES.

A natural gas company whose main business is not the production of gasoline is not to be denied the right of eminent domain and prevented from taking land for a right of way for its pipe line on the ground that it has erected compressors and gasoline plants or stations for extracting the gasoline and purifying the gas, and that incidentally the corporation will reap a profit from the gasoline so extracted. But the conservation of gasoline which is desirable if not almost imperative is not the only purpose of extracting it, but it thereby serves the public with a purer quality of gas without material detriment to its heat properties and it also avoids waste by doing away with line drips for draining and blowing out the gasoline and water that accumulates in the pipes, and it also prevents the destruction of the gaskets. According to experts such plants for conserving the product and facilitating its transportation is regarded as the best and most scientific methods used by practically all large companies engaged in the transportation of natural gas.

Pittsburgh & West Virginia Gas Co. v. Cutright, —— W. Va. ——, 97 Southeastern 686, p. 687.

PIPE LINE FOR NATURAL GAS—PRESUMPTION.

A company engaged in transportation and serving the public with gas may condemn land for its pipe line; and land taken for such use is none the less a public use because the pipe lines were carried to a gasoline plant for the purpose of extracting and preserving the gasoline and for extracting water and other liquid substances to purify the gas and to facilitate its transportation through the pipe lines to consumers.

Pittsburgh & West Virginia Gas Co. v. Cutright, —— W. Va. ——, 97 Southeastern 686, p. 687.

WRONGFUL APPROPRIATION—TRANSFER OF RIGHT.

No right can be acquired in private property under the power of eminent domain, except upon making just compensation for the land appropriated. The corporation or person originally taking or occupying the property can not transfer to a successor or another by lease or otherwise any right in the property taken, except subject to the same duty of making just compensation.

Hazard Dean Coal Co. v. McIntosh, —— Ky. ——, 209 Southwestern 364, p. 367.

WRONGFUL APPROPRIATION—LIABILITY OF PURCHASER.

A coal company by its purchase of the property rights and franchises of another coal company and entering upon and continuing, to the exclusion of the landowner, the use of the lands occupied by its railroad, and that had been wrongfully appropriated by the former coal company and by such user continued the consequential injuries to the land, will be deemed to have adopted the wrongful appropriation of the land and to become equally with its vendor, the original wrongdoer, and liable to the landowner for damages resulting from the wrongful appropriation of the land.

Hazard Dean Coal Co. v. McIntosh, —— Ky. ——, 209 Southwestern 364 p. 366.

MINING CORPORATIONS.

INCORPORATION—SIMILARITY OF NAMES—RIGHT TO INJUNCTION.

A corporation was organized in the State of Washington under the corporate name of the "Diamond Drill Contracting Company." Subsequently another corporation was organized by the name of the "International Diamond Drill Contracting Company." The statute of Washington (Remington Code 1915, section 3680) provides that no corporation shall take a name so closely resembling the name of an existing corporation as to be misleading. The Diamond Drill Contracting Company could not maintain an action to enjoin the operations of the International Diamond Drill Contracting Company where it appeared that the name was not in fact misleading and where there was no evidence to show that the suing company had suffered any loss of business or to show that the defendant company had obtained any information as to the complainant's business and the defendant company had taken no advantage of the confusion to benefit thereby by reason of the similarity in names.

Diamond Drill Contracting Co. v. International Diamond Drill Contracting Co., —— Wash. ——, 179 Pacific 120, p. 122.

A corporation by the name of the Oklahoma Producing & Refining Company was duly incorporated under the laws of Delaware. Subsequently the Oklahoma Consolidated Producing & Refining Company was incorporated. When the similarity of the names of two corporations is such as that it is probable that the public would be deceived thereby and when the names are such as tend naturally and inevitably to harm the older corporation, then the older corporation is entitled to a preliminary injunction until the case can be fairly heard on the proofs.

Oklahoma Producing & Refining Co. v. Oklahoma Consol. Producing & Refining Co., —— Delaware ——, 106 Atlantic 38, p. 39.

FILING REPORT OF ORGANIZATION—DUTY DISPENSED WITH.

The Mississippi statute of 1906 (Hemingway's Code, section 4104) requires a corporation to file its report of organization within thirty days and on the failure to do so the charter shall be null and void and the incorporators shall be liable as partners. The legislature has power to dispense with such formality and an act passed after a failure on the part of a corporation to meet such requirement will prevent the charter from becoming void.

Southern Coal Co. v. Yazoo Ice & Coal Co., —— Miss. ——, 80 Southern 334, p. 335.

ACTS OF DIRECTORS—PAROL PROOF.

Any act of a board of directors of a mining corporation may be proved by parol testimony when it is shown that no record was made of such action or if a record was made and was lost.

Copper King Min. Co. v. Hanson, —— Utah ——, 176 Pacific 623, p. 624.

AUTHORITY OF PRESIDENT.

The president of a corporation ordinarily has only the powers of a director or such additional powers as may be directly conferred upon him by the board of directors. The president or general manager of a corporation sometimes exercises quite extensive powers in the executive management of its business, but he is nevertheless acting all the time under the express or implied authority of the directors who are the real managers of the corporation.

Copper King Min. Co. v. Hanson, —— Utah ——, 176 Pacific 623, p. 625.

AUTHORITY OF PRESIDENT—LIABILITY OF CORPORATION.

The president of a mining corporation has authority to employ a general manager for the company and to bind the company to pay the employee such salary as he and the president agreed upon.

Virginia Talc & Soapstone Co. v. Hurkant, —— Va. ——, 98 Southeastern 681.

AUTHORITY CONFERRED ON PRESIDENT—IMPLIED RESCISSION—TERMINATION OF AGENCY.

At a meeting of a board of directors of a mining company the president was made the agent of the company to sell certain treasury stock for the purpose of raising funds needed for the use of the company. At a subsequent meeting the president reported to the directors that there was no sale for the stock, but no record was made of such proceedings. Subsequently the board of directors acting with the president, recognizing the necessity of having money to pay the indebtedness and expenses of the company levied an assessment upon the stock and from the funds thus raised the indebtedness was paid and a balance left in the hands of the treasurer. By this assessment the object for which the president was authorized to sell the treasury stock was removed and the necessity for the sale no longer existed. This action was an implied rescission of the former authority conferred upon the president and the authority so given him to sell the stock was canceled and repealed by the acts of the directors in which the president participated.

Copper King Min. Co. v. Hanson, —— Utah ——, 176 Pacific 623, p. 625.

AUTHORITY OF PRESIDENT—SALE OF STOCK.

The president of a mining company has no implied authority to sell its treasury stock.

Copper King Min. Co. v. Hanson, —— Utah ——, 176 Pacific 623, p. 625.

RESOLUTION MAKING THE PRESIDENT THE AGENT—CONSTRUCTION.

The directors of a mining corporation by a resolution gave the president authority to sell a certain number of shares of treasury stock The effect of this action was to name the president the agent of the company to do the acts mentioned in the resolution. Authority so granted is controlled and governed by the same rule applicable to contracts between individuals and the intent of the parties must be gathered from the reading of the resolution interpreted in the light of the circumstances and reasons existing at the time of its passage.

Copper King Min. Co. v. Hanson, —— Utah ——, 176 Pacific 623, p. 624.

PRESIDENT ACTING WITHOUT AUTHORITY—PERSONAL LIABILITY.

The president of a fuel company acting for it without authority and under circumstances by which the corporation itself would not be bound would himself be personally liable.

Clinchfield Fuel Co. v. Henderson Iron Works Co., 254 Federal 411, p. 416.

AUTHORITY OF OFFICER—NOTICE TO THIRD PERSONS—EXCEPTION.

Where a third person deals with an official of a corporation concerning the property of the corporation for a consideration personal to the officer himself and not for the benefit of the corporation, he is bound to inquire as to the authority of the officer to make the disposition of the corporate property. But the rule does not apply where a third person purchases or takes a certificate of stock for collateral security for a loan to the secretary of the company where the certificate on its face appeared to and had in fact for a period of two months or more been the property of the secretary and where it appeared to be regularly issued by the proper officers and attested by the seal of the corporation.

Green v. Caribou Oil Co., —— Cal. ——, 178 Pacific 950, p. 952.

AUTHORITY OF GENERAL MANAGER.

The general manager of a coal company operating coal mines on leased lands has no authority to give, sell, trade, or release to another coal company any part of the leasehold estate.

Carroll Cross Coal Co. v. Abrams Creek Coal & Coke Co., —— W. Va. ——, 98 Southeastern 148, p. 151.

COAL COMPANY—AUTHORITY OF GENERAL MANAGER.

It was the business of a general manager of a coal company to conduct the mining operations of the company, the digging and selling of coal, employment and direction of the necessary labor, payment of wages, and the like; but he had no implied authority to give, sell, or release any portion of the mining territory to another coal company.

Carroll Cross Coal Co. v. Abrams Creek Coal & Coke Co., —— W. Va. ——, 98 Southeastern 148, p. 151.

UNAUTHORIZED LEASE BY GENERAL MANAGER—ESTOPPEL.

A coal company was engaged in mining coal from mines on leased lands. Its mining operations were under the direction of a general manager. During the process of mining the general manager without authority executed an agreement and lease to another mining company by which it entered upon the leased land and mined and removed coal. The sublease was not ratified by the mining company and did not estop it from recovering compensation for the coal so mined nor from the enforcement of the statutory penalties inflicted for mining within a prohibited area along the boundary line between the leases under which the two companies were respectively operating. The sublessee was bound to know that the general manager had no authority to make such a lease unless the authority was expressly conferred and the sublessee must to protect itself ascertain whether such authority had been conferred upon the general manager.

Carroll Cross Coal Co. v. Abrams Creek Coal & Coke Co., —— W. Va. ——, 98 Southeastern 148, p. 152.

PROMOTERS AS AGENTS.

The promoters of a corporation to be formed are generally to be regarded as the agents of the corporation and a contract made by them on behalf of themselves and the corporation, when accepted by the corporation after organization, is binding upon both the promoters and the corporation accepting the benefits of the contract.

Wallace v. Eclipse-Pocahontas Coal Co., —— W. Va. ——, 98 Southeastern 293, p. 295.

CONTRACT OF PROMOTERS—NOTICE TO CORPORATION.

The promoters of a corporation entered into a contract for the purchase and taking over and operating a large tract of coal land. After the corporation was formed it accepted the contract of the promoters and received a conveyance of the land described in the contract. The corporation by receiving and accepting the benefits of the contract and the promoters and incorporators of the corporation are charged with notice of all the terms and conditions of the contract.

Wallace v. Eclipse-Pocahontas Coal Co., —— W. Va. ——, 98 Southeastern 293, p. 295.

CONTRACT BY PROMOTERS—ACCEPTANCE BY CORPORATION—SPECIFIC PERFORMANCE.

The owner of a lease of coal lands who agreed with promoters of a corporation to convey the leasehold to the corporation when formed in consideration of the issuance of stock equivalent to the one-fifth value of the property when equipped for mining, may on the acceptance of the contract by the corporation enforce specific performance thereof against the corporation and compel it to issue to him the shares of stock representing the one-fifth value of the property.

Wallace v. Eclipse-Pocahontas Coal Co., —— W. Va. ——, 98 Southeastern 293, p. 295.

CONTRACT WITH PROMOTERS—AGREEMENT TO TRANSFER PROPERTY FOR STOCK.

The owner of a lease of certain coal lands entered into a contract with promoters of a proposed corporation by which he was to sell and convey to the corporation the leasehold and to accept in payment fully paid up stock equal to a one-fifth interest of the value of the property when fully equipped for mining and producing coal. This agreement on acceptance by the corporation gave the contractor the position of a subscriber to the capital stock of the corporation and gave him the right by a bill in equity to compel the issue of the proper certificates of stock.

Wallace v. Eclipse-Pocahontas Coal Co., —— W. Va. ——, 98 Southeastern 293, p. 295.

PROMOTER'S CONTRACT TO PURCHASE MINE—ADOPTION BY CORPORATION—RIGHT OF VENDOR TO TREASURY STOCK.

The owner of mining property conveyed the same to a mining company pursuant to a contract entered into with the promoters of the company and accepted in part payment shares of the company's stock. A certain number of shares of stock was deposited in a bank to secure the second installment due on the purchase price. Under an agreement that on failure to make the payment the vendor should be entitled to an absolute delivery of the stock deposited, the vendor was, on the failure of the company to pay the installment, entitled to receive the stock deposited in escrow in lieu of the cash payment.

Wilson v. Mears, —— Wash. ——, 177 Pacific 815, p. 817.

CONTRACT WITH PROMOTERS—TRANSFER OF PROPERTY FOR STOCK—CONSTRUCTION.

A contract with promoters of a corporation provided for the sale and transfer to the corporation of a coal lease, the seller to accept in payment fully paid up stock to the value of one-fifth interest in the property when fully equipped for mining and producing coal. The provision "a one-fifth interest in the property fully equipped," means in the light of the facts and circumstances surrounding the parties a sufficient amount of stock to equal one-fifth of the value of the property equipped with a tipple, tracks, haulways, cars, and all necessary machinery and motive power to successfully carry on one operation on the property; but the contract does not contemplate that the seller's interest would always represent a one-fifth interest in the property.

Wallace v. Eclipse-Pocahontas Coal Co., —— W. Va. ——, 98 Southeastern 293, p. 296.

PROMOTER'S PROPERTY EXCHANGED FOR STOCK—RELIEF.

The fact that the promoters of a corporation exchanged their property for stock of the company at a price agreed upon between themselves and the corporation, no rights of creditors being involved, and subsequent stockholders obtained full value in the purchase of their stock, gives no right of action in the corporation subsequently to cancel such promoter's stock upon the mere allegation that the property was of less value than as agreed upon.

Roberson v. Draney, —— Utah ——, 178 Pacific 35, p. 39.

STOCK ISSUED TO PROMOTERS—RIGHT OF STOCKHOLDER TO CANCELLATION.

The right of a stockholder to sue for the cancellation of stock wrongfully issued to promoters depends on whether the corporation or the stockholder has suffered any tangible wrong or injury to his property rights through the wrongful acts of the directors, officers, or stockholders complained of and not whether the suing stockholder acquired his stock before or after the acts complained of, if he is not a mere interloper and is acting in good faith and not estopped from otherwise maintaining the action.

Roberson v. Draney, —— Utah ——, 178 Pacific 35, p. 38.

PROMOTERS—LIABILITY TO ACCOUNT FOR STOCK ISSUED—GOOD FAITH.

A coal entryman, unable to complete his entries, pay his obligations, and obtain title to the land, arranged with three other persons to form a corporation and obtain funds by which the corporation could acquire the title to the coal lands. A corporation was organized with a capital of $50,000, the required 10 per cent of the capital was paid in by the promoters, and the coal entries completed and the title to the land conveyed to the corporation. Subsequently the capital stock of the corporation was increased to $250,000 and a large part of the stock issued to the four promoters and the remaining part sold to purchasers at a small per cent of its par value. The corporation under the management of the original promoters proved successful and profitable, and the stock was worth from three to five times what the purchasers paid. The promoters were charged with no fraud or misrepresentation in the matter, neither in the increase of the capital stock, in the issuance of the stock to themselves as promoters, nor in the sale of the stock to the purchasers. Under this state of facts neither the corporation nor the stockholders could maintain a suit in equity to cancel any part of the shares issued to the promoters or to compel them to restore to the corporation any part of their stock on the sole ground that they had made greater profit out of the enterprise than those who had purchased their shares of the stock.

Roberson v. Draney, —— Utah ——, 178 Pacific 35, p. 39.

COAL LOCATION—STOCK TO PROMOTERS—LIABILITY AND CANCELLATION.

An entryman on public coal lands who had expended considerable labor and money in making developments and had incurred large obligations was not able to secure the funds to discharge his obligations and protect his entry. To avoid loss, he with others organized a corporation and the entries were transferred to it in payment for stock that was distributed in proportion to the money advanced. After the incorporation other persons purchased the stock and the entire transaction resulted in a profit to the corporation and its stock was worth par by reason of the coal values of the land. Under these circumstances a person who purchased stock of the corporation can not recover from the promoters on the ground alone that the promoters reaped greater profits than the purchasers of the stock.

Roberson v. Draney, —— Utah ——, 178 Pacific 35, p. 39.

ISSUE OF STOCK—TRANSFER—POWER OF CORPORATION.

An oil company can not enforce the code rule to the effect that a transfer of shares of stock is not valid, except as to the parties thereto until it is entered on the books of the corporation, as against the authority of its own officers to issue certificates of stock within the apparent scope of their authority.

Green v. Caribou Oil Co., —— Cal. ——, 178 Pacific 950, p. 952.

UNAUTHORIZED SALE OF STOCK BY PRESIDENT—VALUE OF STOCK—PROOF OF CONSPIRACY.

The president of a mining corporation without authority sold certain of its treasury stock to a third person. In an action by the corporation to cancel and set aside the sale on the alleged grounds that it was without authority and was pursuant to a conspiracy between the president and the purchasers of the stock to obtain control of the corporation, it is proper on the trial of the case to prove the value of the stock and that it was sold for less than its value as tending to prove the charge of conspiracy.

Copper King Min. Co. v. Hanson, —— Utah ——, 176 Pacific 623, p. 625.
See Lochwitz v. Mine & Milling Co., 37 Utah 349, p. 355; 108 Pacific 1128.

UNAUTHORIZED SALE OF STOCK—SUIT BY CORPORATION TO CANCEL.

The president of a mining corporation without authority sold certain of its treasury stock to a third person. Thereupon the corporation by authority of the board of directors brought an action in a court of equity alleging the issuance of the stock without authority and tendered to the purchaser all the money paid for the stock. Under well-settled rules of equity and in view of the fact that the corporation offered to save the purchaser from loss a court of equity has power to cancel the stock and order its surrender and direct the repayment to the purchaser of such money as had been paid upon the stock.

Copper King Min. Co. v. Hanson, —— Utah ——, 176 Pacific 623, p. 625.

STOCK AS COLLATERAL—VALIDITY OF ISSUE—AUTHORITY OF OFFICERS.

A third person made a loan to the secretary and transfer agent of an oil company and accepted as collateral security a certificate representing shares of stock purporting to be owned by the secretary and bearing the signatures of the vice president and the secretary and the seal of the corporation. The secretary was insolvent, but the stock was worth more than the principal and interest of the sum loaned. The lender had the right to rely upon the secretary's honesty. the signature of the vice president, and upon the verity of the instrument presumed from the fact that the corporate seal was attached. The corporation could not, as against the claim of the lender of the money, show that the certificate was false and fraudulent where the names were not forged, but the vice president and the officers of the company were negligent in permitting the share of stock to be issued.

Green v. Caribou Oil Co., —— Cal. ——, 178 Pacific 950, p. 951.

FRAUDULENT ISSUE OF STOCK—ESTOPPEL.

A mining corporation is estopped from disputing the authority of its own officers to issue stock within the apparent scope of their authority; but the corporation is not estopped from disputing the validity of a transfer of stock or from refusing to enter the same on its books.

Green v. Caribou Oil Co., —— Cal. ——, 178 Pacific 950, p. 952.

FRAUDULENT TRANSFER OF STOCK—TITLE OF TRANSFEREE.

The stock of an oil refining company was kept by the owner in his private office, and without any authority and without being indorsed by him possession of the stock was obtained by a third person and was by such third person delivered to a purchaser and a creditor in payment of the indebtedness of the owner of the stock. Such a delivery and pretended transfer of the stock gave no title to the transferee.

Crichton v. Louisiana Oil Refining Co., 144 La. ——, 81 Southern 213.

FAILURE TO PAY DEBT—LIABILITY OF ONE DIRECTOR.

A mining company was managed by a board of directors of which a promoter was one. In the absence of proof that would lead to a contrary belief a court must assume that the company did not meet its payment for mining ground purchased because it did not have, and had no way of raising, money on the security it had with which to pay. Under such circumstances there is no ground for rendering a personal judgment against the promoter director, where the corporation had voluntarily assumed the liabilities.

Wilson v. Mears, —— Wash. ——, 177 Pacific 815, p. 818.

LIABILITY OF STOCKHOLDERS.

A stockholder in a mining corporation who owned stock for which payment had not been made to the corporation and who is not a bona fide holder of the stock is liable on the insolvency of the corporation to the creditors of the corporation for the unpaid balance of the par value of the stock, so far as may be necessary to pay such creditors, notwithstanding the fact that the stock may be fully paid and nonassessable as between the corporation and the stockholder.

Caledonia Coal Co., In re, 254 Federal 742, p. 746.

INSOLVENCY—INDEBTEDNESS TO STOCKHOLDER—RECOVERY.

A stockholder who purchased his stock from another with notice that the seller had not paid the corporation in full for such stock is not entitled to present and have allowed a claim against the company after bankruptcy as against other creditors until he has paid the amount remaining due upon the original purchase of the stock.

Caledonia Coal Co., In re, 254 Federal 742, p. 746.

LIABILITY FOR SERVICES OF ATTORNEY.

A mining corporation may be liable for the services of an attorney where such services were rendered for the company with knowledge of those whose duty it was to take charge of its affairs.

U. S. Molybdenum Co., In re, 255 Federal 790, p. 791.

LIABILITY TO ATTORNEY OF ADVERSE PARTY.

A mining corporation is under the statute of Oklahoma liable to the attorney of the adverse party in a pending suit where it compromised and settled the action in the absence of the attorney of such adverse party.

Oklahoma Coal Co. v. Hays, —— Okla. ——, 176 Pacific 931.

PURCHASE OF OIL LEASE—FRAUD—RECOVERY.

A corporation was induced by the fraudulent representations of the agent of another corporation to purchase from it a mining lease. The price agreed to be paid was some three times the actual value of the lease. The corporation did not so far ratify the contract that it could have no relief for a failure to rescind the purchase on discovery of the fraud, or from the fact that certain of its officers and stockholders innocently repeated the representation in order to sell the stock.

Barnett Oil & Gas Co. v. New Martinsville Oil Co., 254 Federal 481, p. 485.

NATURAL GAS COMPANY—METHODS OF DISCHARGING DUTIES—APPROPRIATION OF LAND.

A natural gas company authorized to serve the public assumes the burden of the public service, and the methods and manner of discharging its duties is largely left to the discretion of its board of directors, and this includes the right to determine the route and quantity of land necessary to be taken for the public use, subject to the control of the courts on the question of the public use.

Pittsburgh & West Virginia Gas Co. v. Cutright, —— W. Va. ——, 97 Southeastern 686, p. 688.

GAS COMPANY—INSUFFICIENT SERVICE—DISCOUNT OF BILLS.

A natural gas company was required by order of the corporation commission to furnish an adequate supply of gas for domestic purposes. The company was permitted to charge a maximum rate based upon the adequacy of the service rendered and the quantity of gas furnished. But on failure of a company to maintain the efficiency required and when the quantity of gas furnished is insufficient for domestic purposes, the commission may compel the company to discount its bills, where the discount ordered bears a fair relation to the falling off in service.

Nowata County Gas Co. v. State, —— Okla. ——, 177 Pacific 618.

LOCAL DISTRIBUTING COMPANIES—INTERSTATE COMMERCE.

A natural gas company engaged in the production and transportation of interstate commerce sold gas to various local distributing companies at separate stations and places along its pipe line. The gas company received in payment of its gas from each distributing company a certain per cent of the receipts of such company's sales to their consumers; but this fact did not make the business of the local distributing companies any part of the interstate commerce engaged in by the producing company and did not prevent the regulation of the distribution and the rates charged by the local companies to their consumers by the State Public Utilities Commission.

Public Utilities Commission of Kansas v. Landon, —— U. S. ——, 39 Supreme Ct. Rep. 389.

MINING RATES—MEANING.

A coal company agreed to deliver to a carrier coal at one dollar per ton with an agreement that the price should be increased or decreased according to any subsequent changes in "mining rates." The term "mining rates" might be an easy matter to be determined by mine operators and by miners as a question of fact and the account settled between the mining company and the carrier on such basis.

West Virginia Traction & Electric, etc., Co. v. Elmgrove Min. Co., 253 Federal 772, p. 773.

"MINING RATES"—CONTRACT TO FURNISH COAL TO CARRIER—EFFECT OF FUEL ACT.

Under a contract made in 1910 a coal company agreed to supply a carrier with coal at the rate of one dollar per ton with an agreement that the rate should increase or decrease with any subsequent changes in "mining rates." After the passage of the act of August 10, 1917 (40 Stats. 276), controlling the distribution of food products and fuel and fixing the price of coal at $2.45, the mining company refused further to supply the carrier except on a basis and the payment of $2.45 per ton. The State fuel administrator on refusing to construe the contract made an order requiring the coal company to supply the carrier with coal, subject to the legal construction of the meaning of the contract. In an action by the carrier to compel the mining company to furnish coal that it might operate its line for the war period under the act of August 10, 1917, the court refused to compel the State fuel administrator to construe the contract and determine the price to be paid; and the court under a demand for equitable relief refused, during the war period, to construe the contract and determine the price that must be paid for the coal but ordered the coal company to furnish coal under the terms of the original contract without prejudice to its rights to recover according to the construction of the contract as to the meaning of "mining rates," as might be determined in an action at law.

West Virginia Traction & Electric, etc., Co. v. Elmgrove Min. Co., 253 Federal 772, p. 773.

EARNINGS—DIVIDENDS—TAXATION.

An oil company took over the earnings and surplus that had accumulated and had been used as capital before the taxing year of certain subsidiary corporations whose stock was owned by the oil company. The oil company with its subsidiaries constituted a single enterprise of transporting, buying, refining, and selling oil. These earnings and the surplus so taken by the oil company can not be called dividends within the meaning of the income-tax law.

Gulf Oil Corp. v. Lewellyn, 39 Supreme Ct. Rep. 135.

SEARCH AND SEIZURES—SUFFICIENCY OF AFFIDAVIT.

An affidavit on which a search warrant was issued stated that contracts, books of account, minute books, ledgers, journals, and other books and papers of a mining corporation had been used as the means of committing the felony of knowingly and willfully asking, demanding, and receiving higher prices per ton for bituminous coal at the mine than the prices prescribed by the regulations in the act of June 15, 1917. It also charged further felony in combining and conspiring with other persons to get excessive prices for bituminous coal, such prices being higher per ton at the mine than the prices prescribed by the regulations under the food and fuel act of August 10, 1917. The affidavit does not set forth the person who committed the alleged felony, does not sufficiently designate and describe the property to be seized, does not set forth how the books and papers were used as the means of committing the felonies, but the averments are mere conclusions and not facts and is wholly defective. The issuance of the search warrant and the seizure of the books, papers, and property of the corporation was a palpable and flagrant violation of the rights granted by the Constitution.

Tri State Coal & Coke Co., In re, 253 Federal 605, p. 607.
See Veder v. United States, 252 Federal 414.

FOREIGN CORPORATIONS—JURISDICTION OF COURT—APPEARANCE.

A foreign corporation submits itself to the jurisdiction of a court of another State where it appears in a pending case and makes a motion to continue the case without making any suggestion that the court was without jurisdiction and without any limitation on an application for a continuance, as all appearances are general unless specially limited and a general appearance is a waiver of process and confers jurisdiction over the person.

Republic Oil & Gas Co. v. Owen, —— Tex. Civ. App. ——, 210 Southwestern 319, p. 320.

FOREIGN CORPORATION—FAILURE TO COMPLY WITH STATUTE.

A West Virginia oil and gas company sought to enforce in the State of Kentucky certain oil leases purchased by it. The statute of Kentucky provides that it shall not be lawful for any foreign corporation to carry on business in that State without compliance with the statute. Under this statute a foreign corporation failing to designate an agent within the State upon which process might be served can not lawfully transact business or enforce any right claimed under a contract made within the State. Neither can such a corporation obtain the right to proceed by complying with the statute after the commencement of an action. A foreign corporation can not invoke the aid of the courts in assisting it to carry on a business which the law makes illegal and forbids such a corporation to do.

Hays v. West Virginia Oil & Gas & By-Products Co., —— Ky. ——, 210 Southwestern 174, p. 175.

MINING PARTNERSHIPS.

FORMATION—CONSTRUCTION OF CONTRACT—LIABILITY.

In definitions of partnerships the element of contract is fundamental and a partnership relation is created only by voluntary contract of the parties and does not arise in any case by operation of law. The cardinal rule for interpreting a contract and determining whether it constitutes a partnership or not is the intention of the parties.

Mackie-Clemens Coal Co. v. Brady, —— Mo. App. ——, 208 Southwestern 151, p. 153.

AGREEMENT TO CONSTITUTE—ACCOUNTING.

The owner of a coal mine was indebted to his mine superintendent in a large sum. It was thereupon agreed that the superintendent should purchase an interest in the mine and that the indebtedness should be taken as a part payment of the interest purchased. It was also agreed that the superintendent was to have a certain stated sum per month until the output reached a certain number of tons per day and the salary was then to be increased to another stated sum. The superintendent received money for the expenses of the mine and also made purchases at the commissary. Under these facts a bill for an accounting may lie as the remedy at law is inadequate, but the accounts must be so complicated as to require consideration by a chancery court.

Julian v. Woolbert, —— Ala. ——, 81 Southern 32, p. 33.

ASSOCIATION—LIABILITY FOR STOCK—ASSETS INCREASED BY STOCKHOLDERS.

A partnership association of miners was organized under the Michigan statute with a capital stock of 5,000 shares of the par value of $10 each. The members did not pay to the association the full face value of the stock, but after the issuance of the stock they performed voluntary labor for the association and thereby increased the value of the assets of the company until they actually exceeded the total capital stock and no dividends were paid the stockholders. On the bankruptcy of the association the claims of the stockholders could not, as against other creditors, be allowed and paid unless and until such stockholders had paid the full face value of their stock. The fact that the capital of the company was increased in value by the labor of the stockholders could not operate as a payment by the stockholders any more than a decrease in value of the capital would reduce the amount to which the stockholders were entitled to credit for payments on their stock subscriptions.

Caledonia Coal Co., In re, 254 Federal 742, p. 746.

PURCHASE BY PARTNER—DUTY TO DISCLOSE FACTS.

A partner as manager of mining operations has the right to purchase the interest of a partner in the mining property, but it is his duty to deal fairly with the selling partner and to disclose the facts and conditions which have come to his knowledge as manager bearing upon the value of the property. He can not take advantage of the purchasing partner by misrepresentation, concealment, or omission to disclose. However, he is not required to express himself relative to matters merely of speculation or surmise, but if he chooses to give an opinion he must act honestly and in good faith. A purchase of an interest by a managing partner after giving fully and fairly the details of the mining operations, the reasonable prospective value of the separate shares where the seller is familiar with such operations and has a fair basis otherwise for determining the value, will not be rescinded because of the purchaser's failure to give a full statement of the conditions merely because the subsequent operations continued to be prosperous and profitable.

Cardoner v. Day, 253 Federal 572, p. 577.

JOINT INTEREST IN OIL LEASES PURCHASED.

Certain parties entered into an agreement to the effect that the parties were to be equally interested in such oil leases in a particular field as were submitted to either and such as all agreed to acquire, but there was no general agreement to become partners in all leases purchased by either of the parties and both parties became interested with other parties in oil leases. The fact that the parties were co-owners of several oil leases did not constitute them general partners as to all leases acquired by either. Under these circumstances one of the parties could not claim an interest in a lease acquired by the other where the particular lease was taken in the individual name of the second party, paid for by him, and when the complaining party never asserted any interest in the lease until many months after its acquisition when it was greatly enhanced in value.

Gorman v. Carlock, —— Okla. ——, 179 Pacific 38, p. 41.

JOINT OWNERS OF LEASE—PARTICIPATION IN PROFITS.

The fact that two persons are the joint owners of a mining lease does not of itself make them partners though they participate in the profits or losses arising from such joint ownership.

Mackie-Clemens Coal Co. v. Brady, —— Mo. App. ——, 208 Southwestern 151, p. 153.

PURCHASE OF MINING LEASES—PARTNERSHIP—LIABILITY.

By a contract in writing the owner of a mining lease agreed to sell a one-half interest in the lease to a purchaser for $500 cash and $700 payable after an inspection of the mine by the purchaser, after the mine was dewatered and the drifts cleaned out ready for inspection. The agreement and the mining lease were deposited in escrow until the mine should be prepared for inspection and should be inspected by the purchaser. The agreement for the sale of the half interest in the lease did not constitute the purchaser a partner of the seller to the extent of making him liable for coal purchased and for the debts incurred in pumping the water from the mine.

Mackie-Clemens Coal Co. v. Brady, —— Mo. App. ——, 208 Southwestern 151, p. 152.

See Diamond Creek Consol. Gold & Silver Min. Co. v. Swope, 204 Mo. 48, 102 Southwestern 561.

INSOLVENCY—CREDITORS—STOCKHOLDERS—RIGHT TO PREFERENCE.

Certain miners organized a partnership association under the statute of Michigan and engaged in the mining of coal on a cooperative plan. Subsequently, at a stockholder's meeting, the financial condition of the company was considered and a resolution adopted to the effect that part of the wages of the stockholders should be withheld on each pay day to provide necessary funds to meet running expenses. Subsequently the association became bankrupt. The deduction of wages under the resolution was in the nature of loans and after proceedings in bankruptcy the stockholders are not entitled to priority over other creditors on such claims on the theory that they were claims for wages for services performed for the association.

Caledonia Coal Co., In re, 254 Federal 742, p. 747.

MINING ASSOCIATION—BANKRUPTCY—WAGE CLAIM.

A mining partnership organized under the statute of Michigan became insolvent and filed a petition in bankruptcy. The association was composed of miners who themselves operated the mining property owned by the association. The statute of Michigan makes all claims for wages preferred and wage claimants are given priority over other creditors. But the bankruptcy act of Congress provides that claims for wages are limited to services performed during the three months immediately before bankruptcy and this statute controls and limits all wage claims to a period of three months preceding bankruptcy.

Caledonia Coal Co., In re, 254 Federal 742, p. 747.

MINING TERMS.

BREAKING ON THE SOLID.

Breaking on the solid is to break ahead, where the mining dirt has not been taken out.

Haney v. Texas & Pacific Coal Co., —— Tex. Civ. App. ——, 207 Southwestern 375, p. 377.

COAL MINE.

A coal mine is a mine or pit from which coal is obtained and the term includes a strip-pit mine.

Richards v. Fleming Coal Co., —— Kans. ——, 179 Pacific 380, p. 382.

DEWATER.

A term applied to pumping and removing water from a mine.

Mackie-Clemens Coal Co. v. Brady, —— Mo. App. ——, 208 Southwestern 151, p. 152.

ESCAPE WAY.

The term, escape way, used in the statute of Alabama means a passageway leading from the inside to the outside of a mine through which the miners can escape to the outside.

Roberts v. Tennessee Coal, Iron, etc., Co., 255 Federal 469, p. 471.

MINE AND MINERALS.

The words "mine" and "minerals" are not definite terms but are susceptible of limitation according to the intention with which the parties use them.

Rockhouse Fork Land Co. v. Raleigh Brick & Tile Co., —— W. Va. ——, 97 Southeastern 684, p. 685.

MINERALS.

In its strict scientific definition "minerals" would include all inorganic matter, but in granting the minerals in a tract of land the term is not used in such comprehensive sense; and the term means primarily all substances other than the agricultural surface that may be used for mercantile or manufacturing purposes whether from mines, as the word signifies, or such as stone or clay that are taken by open workings. The term in its commercial sense may be defined as any organic substance found in nature having sufficient value separate from its situs as a part of the earth to be mined and quarried or dug for its own sake or its own specific use.

Rockhouse Fork Land Co. v. Raleigh Brick& Tile Co., —— W. Va. ——, 97 Southeastern 684, p. 685.

MINING.

Mining as applied to the act of coal mining at the face is the taking of the clay out from under the coal so a miner can get the coal down.

Haney v. Texas & Pacific Coal Co., —— Tex. Civ. App. ——, 207 Southwestern 375, p. 377.

MOIL.

A moil is a rock chisel used in cutting samples of ore.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 177 Pacific 29, p. 30.

MUCKER.

A mucker is a miner whose duty it is to load ore in the heading on cars after the ore has been extracted by the miners.

Republic Iron & Steel Co. v. Harris, —— Ala. ——, 80 Southern 426.

PUSHER.

A pusher is a man whose duty it is to push loaded cars from the face of the coal to the foot of the incline.

Abelstad v. Johnson, —— N. Dak. ——, 170 Northwestern 619, p. 620.

SHIFT.

By shift is meant a day's work.

Haney v. Texas & Pacific Coal Co., —— Tex. Civ. App. ——, 207 Southwestern 375, p. 377.

SKINNER.

A name given in some mines to the driver driving horse cars that haul the loaded cars out and the empty cars into the mine.

Johnson v. Silver King Consol. Min. Co., —— Utah ——, 179 Pacific 61.

SLOPE.

The term "slope" in a mining statute or in mining parlance means an inclined way, passage, or opening used for the same purpose as a shaft and is sometimes used as embracing the main haulage passageway, whether inclined or level.

Roberts v. Tennessee Coal, Iron, etc., Co., 255 Federal 469, p. 471.

SQUEEZE.

A sqeeze is a term used where the whole earth comes down and settles over the timbers where the coal and stuff has been taken out and there is nothing to hold it up. It is a gradual coming down of the whole earth.

Haney v. Texas & Pacific Coal Co., —— Tex. Civ. App. ——, 207 Southwestern 375, p. 377.

STRAIGHT FACE.

A straight face in mining is not to allow the coal to have butts in it sticking out into the room but to keep it straight all along and even.

Haney v. Texas & Pacific Coal Co., —— Tex. Civ. App. ——, 207 Southwestern 375, p. 376.

MINING CLAIMS.

NATURE AND GENERAL FEATURES.

UNAPPROPRIATED GOVERNMENT LAND.

A mineral location to be valid must be made upon unappropriated Government land open to location and in which mineral has been actually discovered.

McKenzie v. Moore, —— Ariz. ——, 176 Pacific 568.

MINERAL CHARACTER OF LAND.

LANDS MORE VALUABLE FOR AGRICULTURE.

An entry of a tract of land for agricultural purposes will prevail over a mineral entry where the only discovery of minerals was a few colors of gold in watercourses flowing through the tract and where the land was more valuable for agriculture than for minerals.

Meyers v. Pratt, 255 Federal 765.

LOCATION OF CLAIM.

METHOD OF MAKING—SUCCESSIVE STEPS.

The first required step in the location of a mining claim is the discovery of mineral-bearing rock within the claim, and such discovery must precede location. The subsequent steps, such as marking the boundaries, posting notice, and recording, are the declaration of title, and the patent is the final evidence of such title.

Butte & Superior Copper Co. v. Clark-Montana Realty Co., 39 Supreme Ct. Rep. 231, p. 234.

TIME FOR COMPLETION.

The time given by the local statute of Arizona within which a mineral location is required to be completed is limited to 90 days after the discovery of mineral on the ground, in any event, and such additional time until conflicting rights intervene.

McKenzie v. Moore, —— Ariz. ——, 176 Pacific 568.

TITLE AND STATUS OF LOCATOR.

There is no analogy between the status of the locator of a mining claim and that of a mere licensee upon the lands of another. The paramount fee of a mining claim remains in the Government until patent, but as to all others the estate acquired by a perfected mining location possesses all of the attributes of a title in fee and so long as the requirements of the law with reference to continued development are satisfied the character of the tenure remains that of a fee. The interest of the locator is treated as a vested estate. The right may be forfeited by a failure to do the required work followed by a relocation; but such forfeiture is in no way similar to the revocation of a license. It is in fact the termination of the right of a vendee or option holder for failure to comply with the covenants or conditions upon which his right of possession and purchase depend. In such case the fixtures belong to the vendor and the defaulting vendee or option holder has no right to remove them, and no agreement for removal can be implied where the fixtures are annexed by a vendee.

Waterson v. Cruse, —— Calif. ——, 176 Pacific 870, p. 872.

LOCATION NOTICE.

COMPLIANCE WITH STATE STATUTES.

A notice of location of a mining claim that failed to comply with the State statute was defective.

Butte & Superior Copper Co. v. Clark-Montana Realty Co., 39 Supreme Ct. Rep. 231, p. 233.

See Hickey v. Anaconda Min. Co., 33 Mont. 46, 81 Pacific 806.

DISCOVERY.

MINERAL AND AGRICULTURAL ENTRIES.

The discovery in beds of watercourses of a few colors of gold is not a sufficient discovery on which to base a mining claim as against an agricultural entry.

Meyers v. Pratt, 255 Federal 765.

RIGHT TO CONTINUE SEARCH.

Until the actual discovery of mineral in place all acts tending to consummate a valid mineral location give the latter no right other than the right to continue a reasonable search for mineral.

McKenzie v. Moore, —— Ariz. ——, 176 Pacific 568.

VEIN OR LODE.

OWNERSHIP OF VEINS.

When the required steps for the location of a mining claim have been properly taken the right is acquired to a vein or lode on its course or dip to the extent that its top or apex is within the surface boundaries of the claim or within the vertical planes drawn downward through them.

Butte & Superior Copper Co. v. Clark-Montana Realty Co., 39 Supreme Ct. Rep. 231, p. 234.

OWNERSHIP OF VEIN—PRIORITY OF LOCATION.

The prior locator of a valid mining location has the title to all veins or lodes whose tops or apexes are within the surface lines of his location. This ownership entitles him to follow the veins or lodes in their downward course and gives him the ownership of all ores within the intersection spaces of any of his veins with other veins from junior locations. These rules obtain although a junior adjoining locator may first obtain a patent for his claim.

Butte & Superior Copper Co. v. Clark-Montana Realty Co., 39 Supreme Ct. Rep. 231, p. 235.

MARKING LOCATION.

SURFACE LINES—EFFECT ON POSSESSORY RIGHT.

The boundary lines of a mining claim as marked on the ground, after the locator's failure to complete his location for any cause, are not evidence of a right to possession nor of the extent of the locator's possession.

McKenzie v. Moore, —— Ariz. ——, 176 Pacific 568, p. 569.

ASSESSMENT WORK.

FAILURE TO PERFORM—FORFEITURE—OWNERSHIP OF FIXTURES.

A mining company as the locator of mining claims and mill site owned in connection therewith erected thereon a quartz mill and other buildings, improvements, and fixtures. At the time the company attached the improvements to the land it was vested with the right to hold the ground so long as it did the annual work required and thereafter until a valid location was made by another. It placed the improvements upon land in which it had an interest and in which presumably it expected to acquire an estate in fee. It failed for more than a year to perform the required assessment work, and a valid relocation was thereupon made of the ground and the quartz mill, buildings, and improvements were within the lines of the relocated claim. The loss of the company's right resulted from its own failure to meet the conditions which were imposed by law, and when a valid relocation of the ground was made the interest of the mining company as the former locator came to an end. These circumstances preclude the inference of any agreement that the company should be allowed to sever and remove the buildings and fixtures after it had permitted its rights in the land to terminate.

Waterson v. Cruse, —— Calif. ——, 176 Pacific 870, p. 872.

LIABILITY OF OWNER TO PERSONS PERFORMING WORK.

The owners of mining claims are liable to persons for furnishing materials and to men performing the assessment work where such materials were purchased and the men were employed by a general agent having authority to do everything in connection with the mining claims necessary to protect the interests of the owners in the claims.

Thomas v. Furesman, —— Cal. App. ——, 178 Pacific 870, p. 873.

STATE STATUTES.

LOCAL REGULATIONS—COMPLIANCE.

Section 2322 (Revised Statutes United States) provides that in the location of mining claims there must be not only compliance with the laws of the United States but with "State, territorial and local regulations." The rule as supported by decisions of courts is that the requirements of State statutes are inoperative only when they conflict with the United States statutes, and the failure to comply with a State or territorial statute renders a mining location destitute of legal sufficiency and leaves a valid location subsequent in time prior and superior to an older location when the locator failed to comply with the State statute.

Butte & Superior Copper Co. v. Clark-Montana Realty Co., 39 Supreme Ct. Rep. 231, p. 234.

See Butte City Water Co. v. Baker, 196 U. S. 119, 25 Supreme Ct. Rep. 211.
Baker v. Butte City Water Co., 28 Mont. 222, 72 Pacific 617.
United States Mining Statutes Annotated, p. 190.

ABANDONMENT.

ACQUIESCENCE IN RELOCATION—EFFECT AS ABANDONMENT.

The owner of certain mining claims had knowledge that a third person had relocated a part of the ground embraced within his claims and that the relocator was in possession and developing the relocated claims. The original owner of the mining claims remained silent and failed to assert any right thereto for more than two years and then only after the relocator had spent a large amount of money upon the claims and had mined and shipped to the smelter much valuable ore. The silence and the long acquiescence of the original owner in the relocation of a part of his claims was in effect an abandonment by him of such relocated part of his claims.

Florence Rae Copper Co. v. Iowa Mining Co., —— Wash. ——, 178 Pacific 462, p. 463.

FORFEITURE.

IMPROVEMENTS—OWNERSHIP ON FORFEITURE.

Improvements or fixtures placed upon mining claims by a locator become a part of the realty and a subsequent appropriation of the land carried with it whatever may be affixed to it. Prior to the determination of his estate by the perfection of a relocation, the original locator may sever and remove all machinery, buildings, fixtures, and improvements that by the manner of their attachment to the soil have become a part of the freehold; but his right of entry for that purpose ceases when his estate is terminated.

Waterson v. Cruse, —— Calif. ——, 176 Pacific 870, p. 871.

EXTRALATERAL RIGHTS.

OWNERSHIP AND ENJOYMENT OF VEINS—EXTENT OF MINING RIGHT.

Section 2322, United States Revised Statutes, gives to the locator of a mining claim the exclusive right of possession and enjoyment of all veins, lodes, or ledges throughout their entire depth. This does not include such veins only as are wide enough to permit of mining perations within their walls but includes all veins of whatsoever width. The statute gives not only exclusive right of possession of such veins, but the exclusive right of enjoyment throughout their entire depth. The exclusive right of enjoyment of a vein must include the right to mine and extract the mineral contained in it, and if the vein itself is too narrow to permit of mining operations within its walls he may under the implication of the statute cut into the country rock on either side of the vein, as otherwise the word "enjoyment" would be without a practical meaning.

Twenty-One Min. Co. v. Original Sixteen to One Mine, 255 Federal 658, p. 660.

EXTENT OF GRANT—MINING VEIN UNDER ADJOINING CLAIM—CONSTRUCTION OF STATUTE.

Section 2322 of the United States Revised Statutes gives to the owner of a mining claim all veins apexing within his surface lines with the right to follow all such veins on their dip, although they may depart from the side lines of his claim and enter or extend through an adjoining claim. But the statute prohibits the owner of any such vein from entering upon the surface of the adjoining claim for the purpose of pursuing his vein after it departs through the side line of his claim. This means that he must mine out the vein under the surface of the entire claim by following the vein itself in his mining operations. The gift and enjoyment of the vein would be fruitless and useless if the owner was limited to his operations within the walls of the vein where it was too narrow or where the changes in direction were so sharp and sudden as to prevent operations within the walls of the vein. To limit the owner absolutely to operations within the walls of the vein would give to the statute a construction entirely too narrow and one which in many, if not in all cases, would defeat the right which Congress granted in apt words.

Twenty-One Min. Co. v. Original Sixteen to One Mine, 255 Federal 658, p. 660.

RIGHT OF APEX OWNER TO FOLLOW BROKEN VEIN.

There existed within a mining claim a lode or vein of rock in place carrying gold and other valuable minerals. The vein on its strike traversed the claim from end to end, the top or apex of which was wholly within the side lines of the claim, but on its downward course or dip the vein departed from the perpendicular and passed out through the side line of the claim into and beneath the surface of the adjoining and of other claims. The owner of the claim was entitled to follow the vein under the statute granting extralateral rights, and this right was not to be denied because the vein terminated at a fault, where by dropping down a distance of 15 or 20 feet at the shaft and a distance of 35 or 40 feet at the boundary of the claim another vein, or a similar vein, was picked up, likewise terminating at a fault. The two existing segments in fact made a single vein sufficient to continue the extralateral rights.

Original Sixteen to One Mine v. Twenty-One Min. Co., 254 Federal 630, p. 631.

MINING VEIN UNDER ADJOINING CLAIMS—EXTENDING WORKINGS BEYOND WALLS OF VEIN.

In mining and operating a lode vein extralaterally underneath the surface of another claim the owner of the vein is not confined to working entirely within the walls of the vein, but he has the right to cut into the country rock on either side of the vein when necessary for the mining operations, either to keep the workings straight or regular, as is customary in such operations where the vein undulates or changes in direction or when the vein narrows down to a width less than the convenient and ordinary width of the usual mining operations. It is not the law that an owner of the vein in mining it under his extralateral rights is confined entirely within the walls of his vein and that these walls can not be transgressed no matter how narrow the space.

Twenty-One Min. Co. v. Original Sixteen to One Mine, 255 Federal 658, p. 659.

PRACTICAL OPERATIONS—DEVIATION FROM VEIN.

In practical mining operations a miner does not go to the expense of removing unnecessary rock, or wandering further from a vein the enjoyment of which the statute gives him, than is necessary for economical work. The extent to which a miner may deviate from a vein must depend upon the characteristics of each particular vein, and no rule can be formulated of general application; but the gift of "all veins" and the "enjoyment" of such veins can not be held to mean only all wide and straight veins that can be mined out through the veins themselves. The statute means that if a vein itself is too narrow for mining operations then the miner may cut into the surrounding rock sufficiently to make the mining operations practical.

Twenty-One Min. Co. v. Original Sixteen to One Mine, 255 Federal 658, p. 660.

FINDING OF FACTS—EFFECT ON APPEAL.

Where a trial court in an action between contesting mineral claimants as to their extralateral rights makes a finding upon all the evidence submitted and on such evidence and finding adjudicates the rights of the contestants, such findings so made upon conflicting testimony are conclusive upon the court on appeal. It is the duty of the court on appeal under such circumstances to accept the finding of facts unless clearly and manifestly wrong.

Butte & Superior Copper Co. v. Clark-Montana Realty Co., 39 Supreme Ct. Rep. 231, p. 236.

RELOCATION.

RIGHT AND TITLE OF RELOCATOR.

A person making a relocation of a forfeited mining claim is clothed with the exclusive right of possession and enjoyment of all the surface included within the lines of his relocation. This carries with it the right of possessing and enjoying anything which has been so affixed to the land as to become a part of it.

Waterson v. Cruse, —— Calif. ——, 176 Pacific 870, p. 871.

LOCATIONS FOR SPECULATIVE PURPOSES—ASSERTION OF RIGHTS—ESTOPPEL.

Experience has taught that locations of mineral-bearing rock are frequently made on public land for speculative purposes only and are often considered of little value until paying ore is discovered in the immediate vicinity and the claims, without expense to the locators, may become of immense value. These possible fluctuations in value demand a different rule from that usually governing vested estates in land and necessitates immediate assertion of inchoate rights in mining claims when, by the exercise of reasonable diligence, locators could have discovered that their claims were being invaded. Locators with knowledge of the fact and after long acquiescence that a third person has located and has developed a part of their claims should be estopped to assert any interest in conflict with that of the relocator. To permit locators under such circumstances to assert an adverse claim to the relocated part of their original claims would be violative of every principle of equity and would result in rewarding them for encouraging the development of the property.

Florence Rae Copper Co. v. Iowa Mining Co., —— Wash. ——, 178 Pacific 462, p. 463.

COOWNER.

MINING COTENANT—ACCOUNTING—EXPENSE ALLOWANCE.

One tenant or coowner who secretly takes the ores of the joint claim and appropriates to himself his cotenant's share of the proceeds is to be allowed in an action for an accounting only the reasonable, proximate, causative expense of discovering and extracting and marketing the ore, but he is not entitled to an allowance of the remote and inconsequential expenses.

Silver King Coalition Mines v. Conklin Min. Co., 255 Federal 740, p. 752.

MINING BY ONE COOWNER—LIABILITY TO ACCOUNT—EXPENSES OF MINING.

A mining cotenant who mined and sold the ores from the joint claim is not entitled to an allowance by way of interest on the amount invested in mine buildings and machinery where there was no proof that such mine buildings and mining machinery were made for the purpose of handling the ore from the joint claim and where the suing cotenant had no title or right to the use of such buildings or machinery.

Silver King Coalition Mines v. Conklin Min. Co., 255 Federal 740, p. 752.

OPERATIONS BY COTENANT—TUNNEL DISCOVERY—ACCOUNTING—EXPENSES ALLOWED.

A coowner and cotenant of a mining claim extended and cleaned out a tunnel through his own individual claim and extended it into and through the claim jointly owned. While so extending the tunnel into the joint claim he discovered and secretly extracted, mined, and sold a large quantity of ore from the joint claim. In an action by the other coowner for an accounting for the ore so mined and sold the mining cotenant is not entitled to an allowance of the expense of extending and cleaning the tunnel, where the tunnel was run through another mining claim and its portal was nearly two miles from the stope from which the ore in dispute was taken, and where none of the ore was taken out from that portal and where the tunnel was used by the mining cotenant for other purposes, the proceeds and income exceeding the cost.

Silver King Coalition Mines v. Conklin Min. Co., 255 Federal 740, p. 750.

COOWNER AS TRUSTEE—DUTY TO ACCOUNT.

It is the duty of a coowner of a mining claim who, in fact, or in law, has become a trustee for the other coowner to notify the coowner of his entry and taking of the ore from the joint claim, and it is his duty to keep the ore separate, to keep an account of it and of its proceeds, and promptly to account for and pay to the coowner and cotenant his just share of the proceeds of the ore.

Silver King Coalition Mines v. Conklin Min. Co., 255 Federal 740, p. 743.
See Silver King Min. Co. v. Silver King Consol. Min. Co., 204 Federal 166, p. 180.
Conklin Min. Co. v. Silver King Mines Co., 230 Federal 553.

POSSESSORY RIGHTS.

PRIORITY OF RIGHTS—DETERMINATION.

The priority of rights in a mining claim is not determined by dates of entries or patents of the respective claims but by priority of discovery and location, and these may be shown by testimony other than the entries and patents.

Butte & Superior Copper Co. v. Clark-Montana Realty Co., 39 Supreme Ct. Rep. 231, p. 235.

POSSESSION AS NOTICE.

The unequivocal possession of a mining claim is notice to all the world of the possessor's rights thereunder.

Butte & Superior Copper Co. v. Clark-Montana Realty Co., 39 Supreme Ct. Rep. 231, p. 234.

ESTOPPEL—ACQUIESCENCE IN RELOCATION.

The owner of certain mining claims had knowledge of an attempted relocation and that the relocator was in possession developing his claim. The original locator remained silent and failed to assert any claim to the property for more than two years. The first assertion of claim to the ownership of the property as against the relocator was after a large amount of money had been expended upon the claims and valuable ore had been mined and shipped to the smelter. At the time of the attempted relocation the original locator had only an inchoate title and the right to possession which was susceptible to abandonment. Under these circumstances the original locator is estopped to assert a possessory right to the mining claims.

Florence Rae Copper Co. v. Iowa Mining Co., —— Wash. ——, 178 Pacific 462, p. 463.

See Grand Prize Hydraulic Mines v. Boswell, 83 Oreg. 1, 151 Pacific 368, 162 Pacific 1063.

RIGHT OF LOCATOR AS AGAINST RAILROAD GRANT.

The possessory right of the locator of a valid mining claim on the public land is superior to any title or right of possession by a subsequent patent and grant to a railroad company; but as to all junior claimants a patent to such land as nonmineral land is conclusive.

Cheino Land & Water Co. v. Hamaker, —— Cal. App. ——, 178 Pacific 738, p. 739.

ADVERSE CLAIM—JURISDICTION OF FEDERAL COURTS—PLEADING.

A complaint in an action to contest the right of possession of a mining claim and the ownership of certain veins averred that the complainant's rights depended upon the construction and application of sections 2322, 2324, 2325, and 2332 of the United States Revised Statutes; and it averred also that the amount in controversy exceeded in value the sum of $3,000. The allegation as to the construction of the sections of the Revised Statutes had jurisdictional purpose and resort was had to a Federal court that the complainants might avail themselves of the provisions of these sections of the United States Revised Statutes; and the allegation was sufficient to show jurisdiction of the Federal court and that such jurisdiction made the suit one involving the application of these sections and was not based on diversity of citizenship and therefore the decision of the Circuit Court of Appeals was not final.

Butte & Superior Copper Co. v. Clark-Montana Realty Co., 39 Supreme Ct. Rep. 231, p. 233.

See Butte & Superior Copper Co. v. Clark-Montana Realty Co., —— Mont. ——, 248 Federal 609.

TERMINATION.

When a locator's exclusive right to the possession of his claim with its appurtenances ceases either by reason of his failure to perform all of the acts requisite to a completed mineral location, or his failure to discover minerals in place within 90 days after his location was initiated, then his exclusive right to possession based upon a mineral location is at an end and he is thereafter holding possession of the public lands by the sufferance of the sovereign owner.

McKenzie v. Moore, —— Ariz. ——, 176 Pacific 568, p. 569.

METHOD OF TERMINATION.

The possession of a mining claim where the statutory requirements have not been complied with is subject to be terminated by the Government or by any citizen of the United States qualified to acquire title to public lands without notice by initiating a claim to the same premises under some law of Congress authorizing the disposal of public lands. But until the Government does intervene or some qualified citizen initiates a better claim to the premises attempted to be located, the locator can not be disturbed in his actual possession.

McKenzie v. Moore, —— Ariz. ——, 176 Pacific 568, p. 569.

MINERAL AND MATTERS INCLUDED.

The unquestionable right of the locator of a mining claim to the area within the boundaries of the claim marked on the ground by the requisite monuments as described in his location notice posted at the location monument carries the right to possession of every appurtenant belonging to the realty including timber, soil, country rock, percolating waters, natural springs, except certain mineral springs and some other matter.

McKenzie v. Moore, —— Ariz. ——, 176 Pacific 568.

POSSESSORY ACTIONS.

ACTION TO RESTRAIN TRESPASS.

The locator of a mining location brought suit to restrain a third person from trespassing upon the claim under a pretended water-right location. The evidence showed that the complainant had not discovered minerals within the surface lines of his claim within the statutory period and it also showed that the defendant had not initiated any valid or legal right to the ground by his attempted and pretended appropriation of water rights. The action was dismissed at the cost of the plaintiff on the theory that he was attempting to restrain a trespass on a valid mineral location instead of bringing an action to protect his possessory right against a trespasser who had initiated no valid right or claim to the ground.

McKenzie v. Moore, —— Ariz. ——, 176 Pacific 568, p. 570.

PURCHASE BY LESSEE—RIGHT TO POSSESSION.

A lessee of certain mining claims during the term of the lease purchased the claims of the owner and lessor. The agreement expressly provided that the sale and purchase should in no wise affect the terms of the lease. The agreement also provided for the deposit of a patent and deed with a certain bank and that on the payment of the full price the bank should deliver the patent and deed to the purchaser. On the deposit of the full amount in bank the owner and lessor of the claim was notified of the deposit of the purchase price but failed to tender the patent and the deed and also failed to demand the payment of the money. After the deposit of the money the lessee as such purchaser refused to pay the royalties as provided in the lease and thereupon the owner and lessor and grantor brought an action for unlawful detainer. But under the contract of purchase when the payment of the purchase price had been made the purchaser was entitled to possession of the property not as lessee but as purchaser and the purchaser was entitled to hold possession under the contract of purchase subject only to the right of the owner and lessor to collect the royalties under the terms of the lease. Upon this state of facts an action for unlawful detainer could not be maintained.

Rayburne v. Stewart-Calvert Co., —— Wash. ——, 178 Pacific 454, p. 456.

SALE AND TRANSFER.

CONVEYANCE—RELEASE OF RIGHTS—EFFECT ON EXTRALATERAL RIGHTS.

The owner of a fourth interest in a mining claim conveyed to the owner of the other interest all right, title, interest, claim, and demand in and to the veins or lodes or deposits therein, together with all the dips, spurs, and angles, and also all the metals, ores, gold, silver, and metal-bearing quartz, rock, and earth therein. The grantor in this deed was the owner of the adjoining prior location. The deed passed no rights or interest that did not belong to the claim or that would not appertain to it and passed the rights and interest only that were derived from the United States by the location of that claim and conveyed by the patent to the locator. The deed was not intended to convey any of the rights of the adjoining claim then owned by the grantor and did not denude it of the extralateral rights that the law conferred upon it and could not in any sense operate as a conveyance of such adjoining claim or any interest in it as well as a conveyance of an interest in the other claim. Neither could the deed operate to estop the grantor as owner of such adjoining claim from exercising his extralateral rights as owner of such claim and prevent him from subsequently following on their dip all veins apexing within his claim into and through the claim his interest in which he had so conveyed.

Butte & Superior Copper Co. v. Clark-Montana Realty Co., 39 Supreme Ct. Rep. 231, p. 236.

PURCHASE BY LESSEE SUBJECT TO LEASE—LIABILITY FOR ROYALTIES.

The owner of certain mining claims leased the claims and was to receive a certain stipulated royalty. During the term of the lease and after its assignment the assignee purchased the mining claims of the original owner and lessor. The contract of purchase expressly provided that it should in no wise affect the lease and agreement originally entered into and that the conveyance of the claims was subject to such lease. Under the terms of this contract of sale and purchase the purchaser, as the assignee of the lease, was bound to continue the payment of the stipulated royalties during the existence of the lease.

Rayburne v. Stewart-Calvert Co., —— Wash. ——, 178 Pacific 454, p. 455.

RIGHTS UNDER GRUB STAKE AGREEMENT.

A purchaser of a mining claim in good faith and for a valuable consideration is not responsible to a third person who is asserting some rights under an original grubstake contract.

Kimball v. Superior Court, —— Cal. App. ——, 177 Pacific 488.

PATENTS.

VALIDITY—IRREGULAR ISSUE—RIGHT TO ATTACK.

A patent to a mining claim or mineral land is not void though irregularly issued and it will pass the title subject to the right of the Government to attack the patent by direct suit for its annulment if the land was known to be mineral when the patent passed.

Cheino Land & Water Co. v. Hamaker, —— Cal. App. ——, 178 Pacific 738, p. 739.

CONCLUSIVENESS.

From the day when a patent issued for a mining claim the patentee's title not only to the surface of the claim, but to every vein or lode, the top or apex of which was found in the boundaries thereof, became unassailable

Butte & Superior Copper Co. v. Clark-Montana Realty Co., 39 Supreme Ct. Rep. 231, p. 234.

EXCEPTION TO CONCLUSIVENESS—PATENTEE'S KNOWLEDGE OF POSSESSORY RIGHTS.

A patent for a mining claim may be conclusive as against a prior claimant to any part of the ground who had failed in his location to comply with State statutes and local regulations. But a patent for a mining claim, the location of which was subsequent in time to an existing location will not protect the patentee as against such prior location although the prior locator failed to comply with the State statute where the patentee had notice that the original locator was in unequivocal possession of his claim at the date of such junior location.

Butte & Superior Copper Co. v. Clark-Montana Realty Co., 39 Supreme Ct. Rep. 231, p. 234.

See Yosemite, etc., Min. Co. v. Emerson, 208 U. S. 25, 28 Supreme Ct. Rep. 196.

MATTERS CONSIDERED—PRESUMPTION.

In an action involving the possessory rights to mining claims in the absence of the record of an adverse suit there is no presumption that anything was considered or determined except the question of the right to the surface. The rule is that on the application for a patent only surface rights are determined.

Butte & Superior Copper Co. v. Clark-Montana Realty Co., 39 Supreme Ct. Rep. 231, p. 235.

See Lawson v. United States Min. Co., 207 U. S. 1, 28 Supreme Ct. Rep. 15.
United States Mining Statutes Annotated, pp. 384, 405, 413, 444.

EVIDENCE OF COMPLIANCE WITH STATUTE

The statutes of some States Montana particularly, make the issue of a patent for a mining claim conclusive evidence of compliance with the requirements of the laws of the State and make valid all locations under them theretofore made where the locator had in any respect failed to comply with the requirements of such laws "except as against one who has located the same ground in good faith and without notice."

Butte & Superior Copper Co. v. Clark-Montana Realty Co., 39 Supreme Ct. Rep. 231, p. 234.

See Yosemite, etc., Min. Co. v. Emerson, 208 U. S. 25, 28 Supreme Ct. Rep. 196.

SUIT TO CANCEL.

The act of Mar. 3, 1891 (26 Stats. 1099), provides that suits by the United States to annul patents shall be brought within six years after the date of the issuance of a patent. But this statute must be construed on the familiar equitable principle that where the victim of a concealed fraud exercises reasonable diligence and fails to discover the fraud or to receive such information as would excite the attention, or incite a person of ordinary prudence to an inquiry that would lead to a discovery of the fraud, the cause of action does not accrue until the discovery of the fraud or the receipt of such information and the bar of the statute does not begin to run until that time. The rule applies although there were no efforts on the part of the person committing the fraud to conceal it from the knowledge of the other person.

United States v. Diamond Coal & Coke Co., 254 Federal 266, p. 267.

SUIT TO CANCEL—LIMITATION OF ACTION—FRAUD—PROOF.

In an action by the United States to cancel a patent for certain coal lands after more than six years from the date of issuance on the ground of fraud, the United States, in order to be released from the bar of the statute, must plead and prove that it exercised reasonable care and diligence to discover the fraud before the expiration of the six years and that it had no knowledge or notice of any action that would have excited the attention of, or that would have incited a person of ordinary prudence and ability to an inquiry that would have led to a discovery of the fraud, and that the patentee concealed the fraud by some trick or artifice or so committed it that it concealed itself.

United States v. Diamond Coal & Coke Co., 254 Federal 266, p. 268.

ACTION TO ANNUL—LIMITATION—FRAUD—PLEADING.

In an action brought by the Government more than six years after the issuance of a patent to cancel and annul it on the ground of fraud, the complainant must set forth specifically what were the impediments to an earlier prosecution of the claim, how the Government came to be so long ignorant of its rights and the means used by the patentee to fraudulently keep it in ignorance and how and when it first came to a knowledge of the matters alleged in the bill. It is not sufficient for the Government to aver that it was ignorant of its claim in 1903 and was aware of it in 1916.

United States v. Diamond Coal & Coke Co., 254 Federal 266, p. 269.

SUIT BY GOVERNMENT TO CANCEL—LIMITATION OF ACTION—FRAUD—APPLICATION TO GOVERNMENT.

The act of March 3, 1891 (26 Stats. 1099), requires actions to vacate and annul patents to be brought within six years after date of issuance. In a suit by the Government brought after the expiration of the six-year period, it must show fraud, want of knowledge of the fraud, and the concealment by the patentee. In such a case the equitable claims of a nation or state appeal to the conscience of a chancellor with the same, but with no greater or less, force than would those of a private citizen and barring the effect of mere delay they are judiciable in a court of chancery by every principle and rule of equity applicable to the rights of private citizens under similar circumstances. Under this statute it can not be said that the United States as a sovereign government is not bound by this statute of limitations. Congress by this act has clearly manifested its intention to make a delay for six years after the date of a patent fatal to a suit to avoid the patent for fraud, unless relief can be granted on equitable principles.

United States v. Diamond Coal & Coke Co., 254 Federal 266, p. 269.

TRESPASS.

WRONGFUL REMOVAL OF ORE—RECOVERY—BURDEN OF PROOF.

In an action by one cotenant to recover the value of ore wrongfully mined and removed the burden is upon the suing tenant to prove that his cotenant took the ore or its proceeds and mingled it with ore in which the complaining tenant had no interest Then the burden of proof and the duty rests upon the tenant charged with removing the ore to prove the amount it took and its proceeds or value and to account and pay therefor. If by reason of the wrongful acts and of the failure of the defendant to keep its cotenant's ore separate from other ore and to keep account of the ore taken and its proceeds or value, the proof of the amount, the proceeds or value, or any facts requisite to make such proof remained at the close evenly balanced, uncertain, or doubtful, the doubt should be resolved in favor of the complainant.

Silver King Coalition Mines v. Conklin Min. Co., 255 Federal 740, p. 743.

PLACER CLAIMS.

"SALTING"—FRAUD—CONSUMMATION OF ACT.

The statute of Arizona makes it a crime to salt a mine—that is, to mingle or sprinkle gold in a mine or in ore in order to change the value of the gold-bearing ore with intent to deceive, cheat, and defraud other persons. The crime is complete under the statute when the acts denounced as a crime were consummated although no person was injured or deceived or defrauded by the act of the person.

Martinez v. State, —— Ariz. ——, 176 Pacific 582, p. 583.

MILL SITE.

LOCATION AND OWNERSHIP.

Mill sites may be located under the United States statutes either in connection with the ownership of a vein or lode or independently of the ownership of a mine by the owner of a quartz mill or reduction works (United States Revised Statutes, section 2337).

Waterson v. Cruse, —— Calif. ——, 176 Pacific 870, p. 871.
See United States Mining Statutes Annotated, 593.

LOCATION—FORFEITURE—EFFECT ON IMPROVEMENTS.

On July 2, 1912, the Southern Belle Mines Company owned and possessed three mill sites located and used in connection with certain lode mining claims. A quartz mill, a dwelling, and a boarding house had been erected on the mill sites and a barn and office building on one of the mining claims. On the above date the mining company sold the quartz mill and the other buildings with the right to remove them. During the year 1913 neither the mining company nor the purchaser performed the labor or made improvements upon the mining claims or on the mill sites. On January 1, 1914, a third person upon making a discovery made a valid relocation of the ground, the boundaries of which included the ground occupied by the mill and the other buildings. Subsequently the relocator commenced to remove some of the buildings, whereupon the purchaser of the buildings brought suit to enjoin the relocator from removing them and from preventing him as such purchaser from removing them. At the time the mining company attached the improvements to the land it was possessed with the right to hold the land so long as it did the annual work required and thereafter until a valid location was made by another. The loss of its right resulted from its own failure to meet the conditions which were imposed by law. It placed the improvements upon land in which it had an interest and in which presumably it expected to acquire an estate in fee. These circumstances preclude the inference of any agreement that it should be allowed to sever and remove the buildings after its rights in the land had terminated. When the relocator made his valid relocation of the ground the interest of the former locator came to an end. By his relocation the relocator acquired the exclusive right of possession and enjoyment of the land, and this necessarily includes everything that was a part of the ground. The purchaser could not by his purchase from the mining company acquire any better title than it had and he was not entitled to any relief whatever.

Waterson v. Cruse, —— Calif. ——, 176 Pacific 870, p. 871.

ABANDONMENT OF LODE CLAIM—EFFECT ON MILL SITE.

Section 2337 of the United States Revised Statutes authorizes the owner of a lode claim to locate a mill site on nonmineral land not contiguous to the vein or lode. The statute permits the location of a mineral site as an adjunct to a lode claim. But where the locator of such a site ceases by reason of abandonment or forfeiture to be the proprietor of the vein or lode the right to the associated mill site is also ended.

Waterson v. Cruse, —— Calif. ——, 176 Pacific 870, p. 871.

PRINCIPAL AND AGENT.

AUTHORITY OF AGENT—LIABILITY OF PRINCIPAL.

An agent located a large number of placer mining claims in the name of and for the benefit of his principals, and they gave him absolutely a free hand in dealing with the claims and trusted him to do everything in and about the location of the claims for the protection of their rights therein. Under this power the agent had authority to employ the owner of an automobile for the transportation of materials and men to and from the mining claims in performance of the annual assessment work.

Thomas v. Fursman, —— Cal. App. ——, 178 Pacific 870, p. 873.

EXTENT OF AUTHORITY—IMPLIED POWERS.

The agent and general manager of a coal company has no implied authority to make a gift or sell or release any part of the mining territory to another coal company.

Carroll Cross Coal Co. v. Abrams Creek Coal & Coke Co., —— W. Va. ——, 98 Southeastern 148, p. 151.

GENERAL MANAGER—IMPLIED POWERS—LIMITATION.

The implied authority of a general managing officer of a corporation is limited to matters that arise in the conduct of the ordinary business of the corporation; and he has no implied authority to transact matters outside of its ordinary business on the theory that any such transaction might enable him to make a profit for his principal.

Carroll Cross Coal Co. v. Abrams Creek Coal & Coke Co., —— W. Va. ——, 98 Southeastern 148, p. 151.

PROMOTERS AS AGENTS.

The promoters of a mining corporation to be formed are generally to be regarded as the agents of the corporation and a contract made by such agents when accepted by the corporation becomes binding.

Wallace v. Eclipse-Pocahontas Coal Co., —— W. Va. ——, 98 Southeastern 293, p. 295.

CONTRACTS OF AGENCY—SEPARATE CONTRACTS.

The effect of an agent's misconduct in respect of one contract relating to certain mining claims would not affect his compensation for services under a separate and distinct contract for the examination of other and distinct mining claims.

Beatty v. Guggenheim Exploration Co., —— N. Y. ——, 122 Northeastern 378, p. 379.

AGENT'S CONTRACT TO SELL COAL—MUTUALITY.

A contract by which a coal-mine operator employed an agent to handle and sell the entire output of lump coal from his mine and by which the agent agreed to use his best endeavors to sell the output of the mine at the full market price is not void for want of mutuality.

Warren v. Ray County Coal Co., —— Mo. App. ——, 207 Southwestern 883, p. 884.

CONTRACT FOR SALE OF COAL—MUTUALITY OF OBLIGATION.

Mutuality of obligation or a consideration for an obligation as applied to a contract between a coal-mine operator and an agent appointed and employed to sell the output of the operator's mine only means that one party agrees to do one thing and the other some other thing. It does not mean that the respective undertakings or obligations shall be equal to or commensurate with one another. If it did, then every contract where one party agreed to do less than the other would be called unalateral merely because the obligation upon one party was not as great as upon the other.

Warren v. Ray County Coal Co., —— Mo. App. ——, 207 Southwestern 883, p. 885.

AGENT'S CONTRACT TO SELL COAL—UNALATERAL CONTRACT MAY BE BILATERAL.

A mine operator appointed and engaged an agent to sell the entire output of lump coal from his mine, the coal to be loaded and shipped on orders supplied by the agent. The agent agreed to use his best endeavors to sell the coal at the full market price and to pay therefor, less a stated commission. If the contract when made was subject to the charge of being unalateral, it could become bilateral and binding by losing its one-sided character, and it became bilateral and valid from the fact that an obligation had arisen on the part of the agent as the second party and thus mutuality or a consideration appears as the binding force.

Warren v. Ray County Coal Co., —— Mo. App. ——, 207 Southwestern 883, p. 885.

CONTRACT OF EMPLOYMENT—CONSTRUCTION—AGENT TO SELL OUTPUT OF MINE.

By a written agreement a coal-mining company constituted a selling company its agent for the exclusive sale of the coal mined, except that sold to a certain railroad company and except during the months of April, May, and June. The selling company obligated itself to use every effort to sell at the highest prices and that it would advertise, introduce, and push the coal to the best possible result in consideration of the exclusive agency. This contract placed upon the agent the duty of selling the entire output of the mine except as stated, and failing in this the principal, the coal-mining company, was authorized to employ another selling agent.

Cassidy Coal Co. v. Norfolk Coal Co., —— Ky. ——, 208 Southwestern 769, p. 771.

AGENT'S OPTION TO INVEST IN BUSINESS—WRITTEN AND ORAL CONSENT.

An agent was employed by a certain exploration company, under a contract by which he was to investigate certain mining claims and by which he agreed not to become interested in or connected with any person engaged in any similar business and such condition was not to be waived except by consent in writing. Subsequently the agent with knowledge of the president and general manager and with their oral consent became interested as a partner with a third person in the purchase of certain mining claims in opposition to the exploration company. Such consent was at least equivalent to an election that the agent, however delinquent, should not be charged as a trustee. The oral consent may not have created an estoppel or modified the contract, but it may have established an election and such an election could be made without a writing.

Beatty v. Guggenheim Exploration Co., —— N. Y. ——, 122 Northeastern 378, p. 381.

EXCLUSIVE AGENCY TO SELL COAL—BREACH OF CONTRACT—EMPLOYMENT OF ANOTHER AGENT.

A coal mining company employed a selling company as its exclusive agent to sell the entire output of its mine. The selling company obligated itself to use every effort to sell at the highest prices and to advertise, introduce, and push the coal of the producing company to the best possible results. The selling company failed to make sales of the entire output and failed to use every effort to sell and did not advertise and push the sale of the coal to the best possible results and failed to make payments for coal shipped on its orders. On failure of the selling company to comply with the contract of agency and to sell the entire output of the mining company's coal, the mining company was justified in the employment of another agent and was not liable to the selling company as for a breach of the contract

Cassidy Coal Co. v. Norfolk Coal Co., —— Ky. ——, 208 Southwestern 769, p. 771.

LIMITATION ON AGENT'S AUTHORITY—EFFECT ON THIRD PERSON.

An agent under the authority of his principals located a number of placer mining claims and was given authority to do everything in and about the location of the claims for the protection of their rights, including the assessment work. Acting under his authority he employed men to perform the assessment work on the claims and hired automobiles to convey the men and materials to and from the mining claims. Under such facts the principals can not escape liability on the ground that they had an understanding with the agent that he was to furnish the money to pay for the assessment work, as such a limitation on the authority of a general agent would not be binding on third persons dealing with the agent as such without knowledge of the limitation.

Thomas v. Fursman, —— Cal. App. ——, 178 Pacific 870, p. 873.

PURCHASE BY AGENT—DUTY TO DISCLOSE FACTS.

The position of an agent as general manager of a mining property gives him peculiar opportunity for knowing all the facts and estimating the reasonable probabilities with reference to the mine, and he must act fairly in all dealings with his partners, the persons for whom he is acting. He may purchase the interest of a partner and principal, but he is bound to disclose the facts and conditions which have come to his knowledge as manager bearing upon the value of the property and can take no advantage by misrepresentation, concealment, or omission to disclose. Under such circumstances he is not required to express himself relative to matters merely of speculation or surmise, but if he choose to give an opinion, he is bound to act honestly and in good faith.

Cardoner v. Day, 253 Federal 572, p. 577.

SECRET COMMISSION OBTAINED BY AGENT—FRAUD—ACCOUNTING.

Two men were employed at stated salaries as agents of an oil-producing company to examine the validity and value and recommend the purchase of leases by the oil company. As such agents they examined and recommended to the oil company the purchase of certain valuable leases. Subsequently the oil company discovered that its agents had secretly and fraudulently received in the transaction a large commission from the selling company, and thereupon sued the agents to recover the amount of the commission so received. The oil company as a part of its relief was entitled to an injunction to prevent the defendants, the former agents, from transferring stock received by them in payment of the secret commission and to the appointment of a receiver to take charge of and hold the stock pending the litigation on the theory that the remedy at law was not adequate.

Goldrick v. Roxana Petroleum Co., —— Okla. ——, 176 Pacific 932, p. 933.

SPECULATION BY AGENT—SURRENDERING PROFITS—TRUSTEE.

An exploration company employed an agent to investigate certain mining claims in the Yukon district, on which the exploration company held an option to purchase. The agent on his examination of the claims under option examined other claims not included in the option but essential to the successful operation of those so included. The agent and a third person as partners purchased rights in the new claims. The exploration company appreciating the importance of those claims in connection with their option determined to buy them. Under these circumstances the exploration company had a right to require the agent to renounce the profits of the transaction and transfer the mining claims at cost to it. Under these facts the agent became a trustee at the election of the principal. When property has been acquired by an agent under such circumstances that he may not in good conscience retain the beneficial interest, equity converts him into a trustee.

Beatty v. Guggenheim Exploration Co., —— N. Y. ——, 122 Northeastern 378, p. 380.

STATUTES RELATING TO MINING OPERATIONS.

CONSTRUCTION, VALIDITY, AND EFFECT.

MEANING OF WORDS AND TERMS.

The use of a word in a mining statute in relation to mines and mining operations is intended to convey the meaning the word has in mining parlance.

Roberts v. Tennessee Coal, Iron, etc., Co., 255 Federal 469, p. 471.

APPLICATION OF STATUTE TO DIFFERENT MINES—VIOLATION—RECOVERY FOR INJURIES.

Section 6326 of the statute of Kansas (General Statutes 1915) prohibits the use of dynamite or other detonating explosives in the preparation of shots intended to be used in a coal mine unless used under rules agreed upon between the mine operators and the miners and approved by the State mining inspector. Section 6327 makes it unlawful for any mine operator to permit the miners to go into any sinking shaft or development work in a coal mine after shots have been discharged before all smoke and gases have been removed. A miner injured by an explosion of dynamite while working as a shot firer sued the mine operator for damages. At the time of his injury he was working in a strip-pit coal mine and claimed that the statute applied only to shaft mines. A coal mine is defined as a mine or pit from which coal is obtained, and if the complainant was working in a pit to obtain coal he was working in a coal mine within the meaning of the act, and inasmuch as he was himself violating the statute he could not recover in an action against the mine operator.

Richards v. Fleming Coal Co., —— Kans. ——, 179 Pacific 380, p. 382.

TREBLE DAMAGES FOR REMOVAL OF COAL—APPLICATION.

The Pennsylvania act of May 8, 1876 (P. L. 142), imposing treble damages for mining and removing coal knowing the coal to be upon the land of another is highly penal and can not be extended beyond the terms expressed in the act. The liability to treble damages is expressly conditioned upon such facts appearing as would justify the conviction of the trespasser of a misdemeanor. The imposition of treble damages is allowable only where the defendant dug the coal "knowing the same to be upon the lands of another." A recovery of treble damages under this act is conditioned on actual knowledge.

Matthews v. Rush, —— Pa. ——, 105 Atlantic 817, p. 818.

OIL WELLS—DRILLING NEAR RAILROAD PROHIBITED.

The statute of Kansas (General Statutes 1915, section 4979) makes it unlawful to drill or operate oil and gas wells within 100 feet of the right of way of any railroad. This statute is not unconstitutional but is a proper exercise of the police power of the State.

Winkler v. Anderson, —— Kan. ——, 177 Pacific 521, p. 522.

DUTIES IMPOSED ON OPERATOR.

BURDEN TO SHOW WANT OF KNOWLEDGE OF DANGER.

The five-man act of Indiana (Burns 1914, section 8020a) places upon a mine operator the burden of proving that he did not know of any threatened danger in order to have avoided injury to a miner, or to have stopped the work before a miner was injured; but this burden is discharged when and however it is established by all the evidence that the danger arose in the progress of the miner's work and that neither the mine operator nor the miner could have known of the danger until the rock fell. The rule applies although the evidence was introduced on the part of the plaintiff.

Snapp v. Steinbaugh, —— Ind. ——, 121 Northeastern 81.

PROPS—FURNISHING AND SELECTING.

A mine owner and operator as required by the statute furnished props in large quantities and it was the duty of a miner to select the proper ones for the different places in which he desired to use them. A mine operator must not carelessly furnish props which he has reason to believe have latent defects that will deceive the miner. But if the operator furnished large quantities and some, for different reasons, are unsuitable in strength, while others are suitable, the miner is charged by the statute with the duty of selecting for himself. Under such circumstances if the miner selects a prop not sound and not of sufficient strength he simply made a bad and careless selection, which must be charged to his own misfortune in case of subsequent injury by reason of the breaking of the prop so selected.

Kube v. Northwestern Coal & Min. Co., —— Mo. App. ——, 209 Southwestern 614, p. 615.

INSUFFICIENT AND INSECURE CONSTRUCTION—EMPLOYMENT OF MINE FOREMAN NO DEFENSE.

The employment of a statutory mine foreman by a coal-mine operator will not relieve him from liability for injuries to a miner where the injury was caused by a defect that was due to original construction and not to want of repair.

Chamberaeti v. Susquehanna Coal Co., —— Pa. ——, 105 Atlantic 277, p. 279.

VIOLATION BY OPERATOR.

NO PRESUMPTION OF VIOLATION FROM ACCIDENT.

A violation of the five-man act on the part of a mine operator will not be presumed merely from the fact that a miner was employed in a mine where more than five persons were employed and that he was killed by the falling of a rock from the roof of his working place.

Snapp v. Steinbaugh, —— Ind. ——, 121 Northeastern 81.

DELEGATION OF DUTY—LIABILITY OF OPERATOR.

The statute of Indiana requires mine operators and other employers to guard dangerous machinery. A mine operator can not relieve himself of the responsibility to maintain such guards by delegating the duty to some one else, not even to a servant that was injured. This duty has by the statute been imposed upon the employer that those working in the plant may be protected and any limitation placed upon the performance of that duty must weaken the purpose and force of the statute.

Vandalia Coal Co. v. Moore, —— Ind. App. ——, 121 Northeastern 685, p. 687.

NEGLIGENCE—PROXIMATE CAUSE.

The death of a tool sharpener employed by a well-drilling company was caused by an explosion of gas that escaped from the well. The statute of Oklahoma prohibits the escape of gas from an oil well and provides a penalty therefor. In an action for damages for the death of the tool sharpener it was proper for the court to instruct the jury that if they found that the statute had been violated and that the facts constituting such violation amounted to negligence on the part of the well-drilling company and that such negligence was the proximate cause of the death of the tool sharpener then the verdict should be for the complainant.

Slick Oil Co. v. Coffey, —— Okla. ——, 177 Pacific 915, p. 917.

PROXIMATE CAUSE—CONCURRENT CAUSES.

In an action by a miner for damages for injuries caused by the failure of a mine operator to guard certain dangerous machinery as required by the statute (R. S. 1914, section 8029), the injured miner is entitled to recover though some other cause than the negligence charged proximately caused or contributed to the injury. In case of the violation of a statute, the proximity cause need not be the only cause.

Vandalia Coal Co. v. Moore, —— Ind. App. ——, 121 Northeastern 685, p. 687.

EMPLOYMENT OF CHILDREN—LIABILITY—PLEADING.

A complaint against a mine operator is sufficient where it alleged that the mine operator by its agents and employees employed a child under sixteen years of age in and about the mine, or where it averred that the defendant, the mine operator, permitted or suffered a child under sixteen years of age to be employed in the mining operations, and that while so employed the child was injured at the forbidden place and that such injury resulted from the employment and was incident to the risks or dangers in and about the business.

Brilliant Coal Co. v. Sparks, —— Ala. App. ——, 81 Southern 185, p. 186.

EMPLOYMENT OF CHILD—LIABILITY.

A complaint in an action for damages for injuries to a child under sixteen years of age employed in a mine must specifically allege that the defendant retained supervision and control of the mine to such an extent that he could have prevented the employment of the child, as otherwise the defendant could not be held liable for the injury complained of. But a complaint is sufficient that alleges that the injuries complained of were proximately caused by defendant's agents and servants who were at the time entrusted by the defendant with superintendence and while acting within the line and scope of their employ, permitted or suffered the plaintiff to be employed is sufficient.

Brilliant Coal Co. v. Sparks, —— Ala. App. ——, 81 Southern 185, p. 187.

EMPLOYMENT OF CHILD—INSUFFICIENT EXCUSE—INSTRUCTION BY MINE FOREMAN.

Where a mine operator employed or permitted to be employed in his mine a child under sixteen years of age, the fact that the mine foreman told the boy not to lie down and go to sleep that a car would run over him would not excuse the mine operator from the duty to keep the child out of the mine.

Brilliant Coal Co. v. Sparks, —— Ala. App. ——, 81 Southern 185, p. 187.

FAILURE TO GUARD MACHINERY.

The statute of Indiana (act of 1899) requires that all cogs shall be properly guarded. The fact that a mine operator permitted cog wheels in operating pumps in his mine to remain unguarded was such a violation of the statute as to constitute negligence per se.

Vandalia Coal Co. v. Moore, —— Ind. App. ——, 121 Northeastern 685, p. 686.

FAILURE TO GUARD MACHINERY—MINER WORKING UNDER SUPERIOR—ESTOPPEL.

A miner working as a pump man in a mine received injuries from dangerous cogs that could have been guarded. The mine boss under which the miner worked knew that the cogs were unguarded and the miner was at the time of his injury working in obedience to an order or direction from the mine boss. In an action by the miner against the mine operator for damages for the injury the mine operator can not be heard to say, after accepting the miner's services for three weeks, that the miner was not under any obligation to obey the order of the mine boss requiring him to work in the place where he was at the time of the injury.

Vandalia Coal Co. v. Moore, —— Ind. App. ——, 121 Northeastern 685, p. 687.

DEFENSES NOT AVAILABLE.

A mine engineer while engaged in his employment was killed by reason of his clothing being caught by a shaft projecting outside of the engine house. There was no covering, protection, or guard over the shaft as required by the bituminous mine statute. In an action for damages for the death of the miner neither the obviousness of the danger nor a usage of the business was a defense available to the mine operator, where the machinery of the shaft was in fact unguarded.

Carley v. Dexcar Coal Min. Co., —— Pa. ——, 105 Atlantic 651, p. 653.

DUTIES IMPOSED ON MINER.

DUTY TO PROP WORKING PLACE.

The five-man act of Indiana (Burns 1914, section 8020a) makes it the duty of the miners to place props where needed. Under this statute there can be no recovery for the death of a miner where the miner, experienced in the working of mines, had set props as near the working face of the coal as the work would permit and where there were in place in the room all props of the proper size and character that could be placed therein and permit the work to proceed and where the rock that fell and killed the miner broke out and fell when the miner picked away the coal which supported the end thereof extending into the working face.

Snapp v. Steinbaugh, —— Ind. ——, 121 Northeastern 81.

SELECTION OF INSUFFICIENT PROPS—LIABILITY OF OPERATOR.

The statute of Missouri imposes upon a mine operator the duty to supply props, and it makes it the duty of a miner to select his props from the supply furnished by the operator and to set props sufficient to protect his working place. The question of when props are needed and what kind of props and the number is left to the judgment of the miner, and where the operator furnished a sufficient supply of props he discharged his duty, and if the miner was mistaken in his judgment as to the need of props in his working place, or if in selecting the props for his use he selected such as were insufficient, the mine operator could not be held liable for a resulting injury to the miner.

Kube v. Northwestern Coal & Min. Co., —— Mo. App. ——, 209 Southwestern 614, p. 615.

MINER'S WORKING PLACE.

DUTY OF MINER TO MAKE PLACE SAFE—DUTY AS TO PROPS.

In an action under the Missouri statute (R. S. 1909, Section 8473) by a miner for damages for injuries caused by the alleged negligence of the mine operator in failing to furnish him suitable props for the roof of his mine, as required by the statute, the evidence showed that the miner and his companion had five or six days previous to the injury selected and set a row of props. After the props were set and shots had been fired and while the miner was working, one of the props broke and a rock fell upon the miner and caused the injury for which he sued. According to the testimony of the injured miner himself and that of his companion, the mine operator had discharged his duty when he furnished props in abundant number and in proper lengths.

Kube v. Northwestern Coal & Min. Co., —— Mo. App. ——, 209 Southwestern 614, p. 615.

DETAILS OF THE WORK—DUTIES INCIDENTAL TO EMPLOYMENT.

A mine operator is not required either actually or constructively to hover over every transaction to keep the miner from hurting himself at his work by an act sounding to folly. The operator may rest somewhat on the fact that the miners have eyes, reasoning faculties, experience, and knowledge in their trade, and a miner in the very act of employment agrees that he will use these faculties. On this theory mine owners and operators may entrust the details of inspecting drill holes and in using and setting props to the miners and he may trust the miner to perform the intermediate, ordinary, and simple duties incidental to his employment and rest upon the miner's knowledge and skill.

Kube v. Northwestern Coal & Min. Co., —— Mo. App. ——, 209 Southwestern 614, p. 616.

FELLOW SERVANT RULE—DEFENSE ABROGATED.

NEGLIGENCE AS A DEFENSE.

In an action for damages for wrongful death under the statute of Utah the defense of the negligence of a fellow servant is available to a mine operator, but in an application for compensation under the Industrial Act such a defense is not available.

Garfield Smelting Co. v. Industrial Commission, —— Utah ——, 178 Pacific 57, p. 60.

ELECTRICAL APPLIANCES.

PROTECTION OF CONDUCTORS.

The statute of Alabama regulates the installation of electricity in mines and provides that conductors in shafts and slopes used as travelingways and in escapeways shall be protected. Under this provision there can be no recovery under the Employers' Liability statute (Code 1907, sec. 3910) for the death of an operator of a coal-cutting machine where the injury did not occur in a shaft or slope of an escapeway. The statutory requirement is applicable only to such conductors "in shafts and slopes used as travelingways and in escapeways."

Roberts v. Tennessee Coal, Iron, etc., Co., 255 Federal 469, p. 471.

EMPLOYMENT OF MINORS.

EMPLOYMENT OF CHILD—LIABILITY.

It is the duty of every mine owner who operates or retains supervision over a mine that is being operated by an agent or contractor, to see to it that no child under sixteen years of age is employed in the mine. This is a duty fixed by statute and when there is a failure to perform the duty, and injury thereby occurs, a cause of action is completed.

Brilliant Coal Co. v. Sparks, —— Ala. App. ——, 81 Southern 185, p. 187.

EFFECT ON CONTRIBUTORY NEGLIGENCE.

DANGERS INHERENT TO EMPLOYMENT.

A mine operator who violated the statute by failing to guard dangerous cog wheels can not allege contributory negligence on the part of an injured miner; nor can he assert as a defense that the dangers or hazards inherent or apparent to the employment in which the miner was engaged contributed to his injury.

Vandalia Coal Co. v. Moore, —— Ind. App. ——, 121 Northeastern 685, p. 687.

KNOWLEDGE OF DANGER.

A workman employed to make repairs in a gasoline tank had entered the tank previous to the time of the accident using without accident or injury an ordinary unguarded electric lamp. The employee knew some gasoline fumes remained in the tank, but suffered no injury or inconvenience because of this. Later in the day while working in the tank the electric lamp was accidentally broken causing an explosion that resulted in the death of the employee. The mere fact that the deceased employee entered the tank knowing that it contained an explosive gas would not of itself constitute contributory negligence; and the findings failed to show conclusively that the employee was guilty of contributory negligence in handling the electric lamp in the manner he did at the time he was injured.

Standard Oil Co. v. Allen, —— Ind. App. ——, 121 Northeastern 329, p. 334.

DEFENSE AVAILABLE.

In an action brought under the statute to recover damages for a wrongful death the defense of contributory negligence is available to a mine operator; but if an application for compensation under the Industrial Act is made, this defense is not available.

Garfield Smelting Co. v. Industrial Commission, —— Utah ——, 178 Pacific 57, p. 60.

INJURY TO CHILD UNDER SIXTEEN.

In an action under the statute of Alabama for damages for an injury to a child under sixteen years of age, injured while employed and working in a coal mine, the defense of contributory negligence can not be invoked.

Brilliant Coal Co. v. Sparks, —— Ala. App. ——, 81 Southern 185, p. 187.

MINER'S DUTY TO SET PROPS—SELECTING INSUFFICIENT PROP.

The statute of Missouri requires a mine operator to furnish props for the use of his miners but it makes it the duty of a miner to select and set the props to protect his working place. If a miner selects and sets props that he knows are insufficient and not of the required strength and continues working with such known insufficient props, he is guilty of such contributory negligence as will defeat recovery for damages for injuries resulting from the use of such props.

Kube v. Northwestern Coal & Min. Co., —— Mo. App. ——, 209 Southwestern 614, p. 615.

EFFECT ON ASSUMPTION OF RISK.

DUTIES DISCHARGED BY MINE OPERATOR.

The evidence in an action for damages for the death of a miner showed that the mine operator had discharged all statutory and common law obligations owing to the miner, and the evidence showed that notwithstanding the discharge by the mine operator of all duties that the character of the work was such that the danger remained. Under such circumstances the deceased miner assumed the risk and the mine operator could not be held liable under a charge of negligence.

Snapp v. Steinbaugh, ——.Ind. ——, 121 Northeastern 81.
See Snapp v. Steinbaugh, —— Ind. ——, 119 Northeastern 485.
Woolley Coal Co. v. Tevault, —— Ind. ——, 118 Northeastern 921.

INJURY TO CHILD UNDER SIXTEEN.

In an action under the statute of Alabama for damages for an injury to a child under sixteen years of age, injured while employed and working in a coal mine, the defense of assumption of risk can not be invoked.

Brilliant Coal Co. v. Sparks, —— Ala. App. ——, 81 Southern 185, p. 187.

DEFENSE ABROGATED.

A mine operator who violated the statute in failing to guard cog wheels can not allege in an action by a miner for damages for injuries caused by such unguarded cog wheels that the miner assumed the risk, nor can he defend on the ground that the miner assumed the dangers or hazards inherent or apparent to the employment in which he was engaged.

Vandalia Coal Co. v. Moore, —— Ind. App. ——, 121 Northeastern 685, p. 687.

A complaint in an action by a miner against a mine operator for damages for injuries, alleged that the mine operated had elected not to accept the provisions of the Illinois Workmen's Compensation Act. A coal-mine operator that has elected not to accept the provisions of that act waives his right to interpose the common law defense of assumed risk.

New Staunton Coal Co. v. Fromm, —— Ill. ——, 121 Northeastern 594, p. 596.

The Bituminous Mine Act of 1911 (P. L. 756) requires all shafting and machinery of every description to be properly guarded or properly fenced off by suitable railing. Under this statute in an action for the death of a miner caused by the failure of the mine operator to guard and fence off certain machinery as required by the statute the defense of assumption of risk is not open to the mine operator.

Carley v. Dexcar Coal Min. Co., —— Pa. ——, 105 Atlantic 651, p. 653.

DEFENSE AVAILABLE.

In an action brought under the statute to recover damages for a wrongful death the defense of assumption of risk is available to a mine operator, but if an application for compensation under the Industrial Act is made this defense is not available.

Garfield Smelting Co. v. Industrial Commission, —— Utah ——, 178 Pacific 57, p. 60.

WRONGFUL DEATH.

PROOF—CIRCUMSTANTIAL EVIDENCE.

Where an accident occurs resulting in the death of an employee and there is no direct proof as to how the accident occurred, the manner of its occurrence may be shown by circumstantial evidence from which a jury may infer the manner and cause of the accident; but the inference must be a reasonable although not a necessarily resulting fact. A plaintiff in such an action is not required to prove his case beyond a doubt, but he is only required to make it appear to be more probable that the injury came in whole or in part from the defendant's negligence than from any other cause.

Silurian Oil Co. v. Morrell, —— Okla. ——, 176 Pacific 964, p. 967.
See Cash v. Kansas Oil Refining Co., —— Kans. ——, 176 Pacific 980.

PRESUMPTION AGAINST VOLUNTARILY INCURRING DANGER.

Where there are no eyewitnesses, the love of life speaks as a silent witness against the assumption of risk, against contributory negligence, and against suicide. The presumption against voluntarily incurring danger is of itself some evidence of lack of knowledge of a latent defect.

Silurian Oil Co. v. Morrell, —— Okla. ——, 176 Pacific 964, p. 967.
See Cash v. Kansas Oil Refining Co., —— Kans. ——, 176 Pacific 980.

CHILD DROWNED IN RESERVOIR—APPEAL—MOTION FOR A NEW TRIAL.

An action was brought by a parent against a mining and smelting company for damages for the wrongful death by drowning of his child, nine years of age, in a reservoir maintained by the mining and smelting company for the purpose of fire protection to its milling plant and reduction works. Recovery was sought on the theory that the reservoir was an "attractive nuisance" and was not safeguarded as required by the statute to secure persons and animals from danger arising from mining and other excavations. A verdict was returned for the defendant, the mining and smelting company. The plaintiff, without moving for a new trial, appealed directly from the judgment to the supreme court. Under the procedure all alleged errors must be presented to the trial court by the way of a motion for a new trial, and errors can not be presented on appeal without such a motion.

Gill v. Goldfield Consol. Mines Co., —— Nevada ——, 176 Pacific 784, p. 785.

THEORY OF RECOVERY—DAMAGES.

The wrong giving a right of action for the death of a miner under the Arizona Employers' Liability Law is attributable not to any fault or negligence of the employer, but to the risks and hazards inherent in the occupation and which are unavoidable by the employees therein; and the "damages" recoverable include only such actual loss to the employee as he has sustained which flows proximately from the accident.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 177 Pacific 29, p. 32.

PERSONS ENTITLED TO DAMAGES—LOSS SUSTAINED.

An employer is liable under the statute of Arizona for the death of an employee to the personal representative for the benefit of the surviving widow and children; and if none, then to the employee's parents or next of kin; and if none, then to the personal representative for the benefit of the estate of the deceased. But no one authorized to prosecute an action can recover damages in an amount greater than the actual loss sustained by the employee.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 177 Pacific 29, p. 32.

EMPLOYERS' LIABILITY ACT.

OBJECT OF LAW.

The Employer's Liability Law is designed to give a right of action to an employee injured by accidents occurring from risks and hazards inherent in the occupation and without regard to the negligence of the employer.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 177 Pacific 29, p. 31.
See Inspiration Consol. Copper Co. v. Mendez, 19 Ariz. ——, 166 Pacific 278, 1183.

CONSTITUTIONALITY—LIABILITY FOR INJURIES.

The Employers' Liability Law of Arizona is not invalid because it attempts to deprive a mining company of its property without due process of law, nor because it denies the equal protection of the law by subjecting the company to unlimited liability for damages for personal injuries suffered by its employees without any fault or negligence on its part.

Calumet & Arizona Min. Co. v. Chambers, —— Ariz. ——, 176 Pacific 839, p. 840.

ACTION UNDER EMPLOYERS' LIABILITY LAW—IMMATERIAL AVERMENTS.

A complaint by a miner for damages for injuries expressly alleged that the action was under the Employers' Liability Law, and therefore the plaintiff is limited to a recovery under that law. Any allegations charging carelessness or negligence or other words used in setting forth negligence as a cause of action have no place in a complaint under the Employers' Liability Law and must be regarded as immaterial surplusage that need not be proved and may be ignored, if the facts stated otherwise are sufficient to constitute a cause of action under the Employers' Liability Law. A proper remedy in such a case is by motion to strike out or to treat such immaterial matter as surplusage.

Calumet & Arizona Min. Co. v. Chambers, —— Ariz. ——, 176 Pacific 839, p. 842.

PLEADING—INJURY RECEIVED IN SCOPE OF EMPLOYMENT.

A complaint by a miner for damages for injuries under the Arizona Employers' Liability Law alleged in substance that the plaintiff while assisting other employees to replace a fettle car on a track believed from a warning given by another employee that the car was overturning and falling upon him, and that to escape from the falling car he jumped back and fell, striking an open slag spout, thereby receiving the injuries for which he sued. The complaint did not allege that as a fact the fettling car was overturning or that it did overturn, but, the plaintiff was led to believe from the warning given that it was overturning, and that acting on such appearances and his belief from the warning he received the injuries. This is sufficient to show that the injury was occasioned by an accident arising out of and in the course of plaintiff's labor, service, or employment and due to a condition or conditions of such occupation or employment.

Calumet & Arizona Min. Co. v. Chambers, —— Ariz. ——, 176 Pacific 839, p. 841.

PLEADING—ALLEGATIONS AS TO NEGLIGENCE—PRACTICE.

A complaint by an injured employee for damages under the Employers' Liability Act of Arizona which also alleges facts constituting negligence is open to attack by a motion to strike out all the allegations of negligence as immaterial. Such a complaint is also subject to attack upon the grounds of duplicity, or to require the plaintiff to declare his purpose and elect whether he will pursue the remedy given by the Employers' Liability Law or the common law for negligence.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 177 Pacific 29, p. 31.

NEGLIGENCE—NO ELEMENT IN RECOVERY.

The Employers' Liability Law of Arizona takes no cognizance of negligence as an element in the right of action given, and the presence in or absence of negligence from the accident relied upon for recovery under the statute adds nothing to or takes nothing from the rights of the parties except that the negligence of the plaintiff may if pleaded be a partial or a complete defense.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 177 Pacific 29, p. 31.

NEGLIGENCE IMMATERIAL.

In actions under the Employers' Liability Law of Arizona the question as to whether the defendant was guilty of negligence which proximately caused the accident and resulting injuries to the plaintiff is wholly beyond the questions involved and immaterial to the inquiry. The cause of action and the right of recovery existed without regard to negligence on the part of the mine operator.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 177 Pacific 29, p. 31.

NEGLIGENCE—EXPLOSION—ACCIDENT—PROXIMATE CAUSE.

The Standard Oil Company was sued for damages for the death of an employee while in the act of repairing a gasoline tank. The death was caused by the breaking of an electric light bulb, which ignited the gasoline fumes and thereby caused the explosion resulting in the death complained of. The complaint charged that the oil company was negligent in not removing the fumes of the gasoline before directing the employee to enter the tank to make the repairs. The proof and the findings showed that the breaking of the electric lamp was accidental; but this could not make the resulting death a pure accident, and the explosion of the gasoline fumes following the breaking of the lamp was the proximate cause of the death, and this, as alleged, was due to the negligence of the oil company and was sufficient to make the oil company liable under the Indiana Employers' Liability Act.

Standard Oil Co. v. Allen, —— Ind. App. ——, 121 Northeastern 329, p. 333.

HAZARDOUS EMPLOYMENT—INJURY—PLEADING.

An injured miner suing to recover under the Employers' Liability Law of Arizona is required to allege in his complaint and to prove by the evidence that he was employed by the defendant in an occupation declared hazardous and while engaged in the performance of the duties required of him was injured, and the injury was caused by an accident due to a condition or conditions of such employment and was not caused by his negligence.

Calumet & Arizona Min. Co. v. Chambers, —— Ariz. ——, 176 Pacific 839, p. 840.

RISKS INHERENT IN OCCUPATION—PLEADING.

In an action under the Employers' Liability Law of Arizona for damages for injuries to a miner it was sufficient where the surroundings in which the plaintiff was performing his duties were described in the complaint with sufficient fullness to show that the risks and hazards assumed by the employee were great and inherent in the occupation and unavoidable by the workman. If there was any deficiency in this respect in the complaint, it was cured by an answer in which was described in detail all the appliances used and the manner of their use, expressly admitting that the occupation of the plaintiff was a hazardous one and required on the part of the employees great care.

Calumet & Arizona Min. Co. v. Chambers, —— Ariz. ——, 176 Pacific 839, p. 840.

NEGLIGENCE OF PERSON HAVING SUPERINTENDENCE—QUESTION OF FACT.

A mucker, working under the superintendence of a person having charge of a heading and of the miners working therein, was injured by a fall of rock. Under the evidence the jury might infer that the mucker suffered his injury by reason of the negligence of the bank boss while in the discharge of the superintendence, who was chargeable with the knowledge and nature of the danger from the loose rock and of the probable consequences of permitting it to remain in the dangerous condition and in the negligence of his superintendent negligently allowing the muckers to continue at work thereunder or in dangerous proximity thereto.

Republic Iron & Steel Co. v. Harris, —— Ala. ——, 80 Southern 426, p. 428.

ELECTION OF REMEDIES.

An injured miner suing for damages for the injuries alleged in his complaint that the action was brought under the Employers' Liability Law. By such election of remedy the plaintiff was precluded from a recovery other than that permissible under the Employers' Liability Law; and the sufficiency of his complaint to state facts constituting the cause of action given by that statute must be tested with reference to the requirements of the statute and the proof must support the complaint both as to the facts authorizing a recovery and as to the amount of damages recoverable.

Calumet & Arizona Min. Co. v. Chambers, —— Ariz. ——, 176 Pacific 839, p. 840.

INSTRUCTIONS—RECOVERY FOR NEGLIGENCE OR UNDER EMPLOYERS' LIABILITY LAW.

In an action by a miner for damages for injuries the court instructed the jury to the effect that the plaintiff claims damages for injuries "by being carelessly and negligently thrown from a ladder" in the defendant's mine. Immediately following this the court instructed the jury that the action was brought under the Employers' Liability Law of Arizona and also instructed to the effect that an employer in mining is liable for the personal injury of an employee by an accident arising out of and in the course of such labor, service, and employment and due to a condition or conditions of such occupation or employment. The court also instructed that if the plaintiff received the injury as alleged and the jury found that such injury was not caused by the negligence of the defendant, but was the result of the plaintiff's own negligence, then the verdict should be for the defendant. These instructions are conflicting as regards the element of negligence, and the jury were required to assume that the burden was on the defendant to repel the presumption of its negligence as a cause concurring with the condition or conditions of the hazardous occupation of the plaintiff in the service of the defendant in order to recover. In an action under the Employers' Liability Law the negligence of the defendant is an immaterial matter in the controversy, and neither the plaintiff nor the defendant is called upon to make any proof in reference thereto, and any instruction as to the burden of proving or disproving negligence of the defendant would be misleading.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 177 Pacific 29, p. 31.

EMPLOYER—LIABILITY FOR LOSS TO EMPLOYEE—PAYMENT OF DAMAGES—MEANING.

The liability for damages under the Employers' Liability Law of Arizona has reference to and means that the employer becomes obligated to pay to the employee injured in an accident while engaged in an occupation declared hazardous, occurring without fault of the employer, all loss to the employee which is actually caused by the accident and the amount of which is ascertainable. But the idea of speculative, exemplary, and punitive damages are excluded from the meaning intended to be conveyed by the language of the statute.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 277 Pacific 29, p. 33.

CONTRIBUTORY NEGLIGENCE—DEFENSE—PLEADING.

An answer to a complaint by a miner for damages for injuries under the Employers' Liability Law of Arizona was not relied upon as stating facts sufficient to set forth contributory negligence as a defense, but the facts were stated as being sufficient to constitute negligence on the part of the plaintiff as the sole efficient and approximate cause of his injuries and therefore a complete defense to the action. Under such an answer the defendant was in no position to raise the question of the validity of the proviso found in paragraph 3159 of the Arizona Employers' Liability Law (Civil Code 1913). The defendant by such answer did not rely upon the proviso or upon any right of defense which conflicts with or is modified by the proviso.

Calumet & Arizona Min. Co. v. Chambers, —— Ariz. ——, 176 Pacific 839, p. 842.

EFFECT ON CONTRIBUTORY NEGLIGENCE—PARTIAL AND COMPLETE DEFENSE.

Whether an employee's negligence becomes an element in actions based upon the Employers' Liability Law of Arizona depends upon whether the defendant sets up negligence on the part of the plaintiff as contributing to the plaintiff's injuries as a partial defense, or the negligence of the plaintiff as the sole, proximate, efficient cause of the injury.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 177 Pacific 29, p. 31.

CONTRIBUTORY NEGLIGENCE—PARTIAL DEFENSE.

An employee working in a smelter was injured in stepping back from a fettling car that he believed was toppling over upon him and stepped into an uncovered hole in the floor. The injuries might be partially attributable to his lack of care in failing to observe and avoid the hole and it might be said that the plaintiff's negligence concurred with the inherent risks and hazards of the employment in causing the injuries complained of. But this does not constitute negligence on the part of the plaintiff such as will defeat a recovery, but constitutes contributory negligence only such as within the contemplation of the proviso in paragraph 3159 of the Employers' Liability Law of Arizona (Civil Code 1913). This proviso is only a modification of the common law rule and is constitutionally valid. The right to interpose contributory negligence is not denied by statute, but is modified, and as modified is fully recognized as a just, though partial, defense.

Calumet & Arizona Min. Co. v. Chambers, —— Ariz. ——, 176 Pacific 839, p. 842.

PROOF OF LOSS—QUESTION OF FACT.

In an action by a miner for damages for injuries under the Arizona Employers' Liability Law the plaintiff must prove by a preponderence of the evidence the actual loss he sustained proximately caused by the alleged accident. Whether he suffered any loss and if any what loss he sustained are questions for the jury's determination from a consideration of all the evidence.

Calumet & Arizona Min. Co. v. Chambers, —— Ariz. ——, 176 Pacific 839, p. 843.

INDUSTRIAL COMMISSIONS.

CONSTITUTIONALITY AND CONSTRUCTION.

The constitution of Utah provides that the right of action to recover damages for a wrongful death shall never be abrogated and the amount recoverable shall not be limited. The constitution refers to and guarantees the statutory remedy for wrongful death. The legislature by the Industrial Commissions Act enlarged the right to compensation and it had the right to determine and to direct the persons who shall enjoy the fruits of the increased or enlarged remedy. An award in a case based entirely upon the enlarged remedy given by the Industrial Act is binding upon all persons. No rights guaranteed by the constitution are abridged or waived and no limitation is imposed contrary to the constitution, since such an award is entirely outside and beyond the right which is protected by the constitution. True, an award may be made in a case where the death was in fact caused by the wrongful act or negligence of the employer, but an applicant under the Industrial Act may ignore that fact and base the application on the provisions of the act alone.

Garfield Smelting Co. v. Industrial Commission, —— Utah ——, 178 Pacific 57, p. 60.

PROCEDURE—RULES OF EVIDENCE—HEARSAY.

The Industrial Commissions Act of Utah provides that the commission shall not be bound by the usual common law or statutory rules of evidence or by any technical or formal rules of procedure other than as provided. For the purpose of determining questions of fact arising under the Industrial Act the commission in order to arrive at the truth may pursue any course or method which to it seems best calculated to arrive at the truth so long as it does not depart from the provisions of the act; and it may thus have recourse to hearsay evidence if such evidence may lead to some technical evidence which sheds light on the ultimate question to be found and determined. But while the commission may have recourse to hearsay evidence to assist it to arrive at the real facts its finding when made must be based on some substantial legal and competent evidence. A finding based entirely on hearsay or other incompetent evidence is not supported by substantial evidence and can not be permitted to stand when seasonably and properly assailed.

Garfield Smelting Co. v. Industrial Commission, —— Utah ——, 178 Pacific 57, p. 63.

ELECTION BETWEEN COMPENSATION AND DAMAGES—RIGHTS OF MINORS.

The Industrial Commissions Act of Utah provides for an election by heirs between compensation for death under the act, or damages in an action at law. The right of action is given regardless of whether the heirs are minors or adults. The waiver provided for in the Industrial Act is not binding on an heir who is not sui juris. Such an heir is incapable of making an election, and his acts; whatever they may be, can not constitute an election and a waiver that binds him.

Garfield Smelting Co. v. Industrial Commission, —— Utah ——, 178 Pacific 57, p. 60.

DEATH ARISING IN THE COURSE OF EMPLOYMENT—COMPENSATION.

Under the Industrial Commissions Act of Utah an accident causing death need not be caused through the wrongful act or negligence of a mine operator or through the wrongful act or negligence of one for whom he is responsible. It is sufficient to entitle a claimant under the act to compensation if the death resulted from an injury that arose in the course of the employment of the deceased, and his acts or negligence do not constitute a bar to the action. The action is barred only in case it is shown that the death was caused through the wilful or criminal act of the deceased.

Garfield Smelting Co. v. Industrial Commission, —— Utah ——, 178 Pacific 57, p. 60.

CAUSE OF DEATH—RIGHT TO TRIAL BY JURY.

The Industrial Commissions Act of Utah gives an employee the right of trial by a jury in case the commission denies his claim for compensation upon the ground "that the accident did not arise out of and in the course of the employment." Inasmuch as the employee is entitled to a jury trial in case his claim is denied upon the ground that the accident causing the injury did not arise out of and in the course of his employment, the employer must be given the same right as otherwise he would be denied the equal protection of the law.

Garfield Smelting Co. v. Industrial Commission, —— Utah ——, 178 Pacific 57, p. 62.
See Industrial Commission v. Evans, —— Utah ——, 174 Pacific 825.

MINOR HEIRS—DETERMINATION OF CAUSE OF DEATH.

Where a claim is made for compensation for the death of an employee against an employer which was caused by an injury arising in the course of the employment, and where the rights of minor heirs are to be determined, the question whether or not the death was caused through the wrongful act or negligence of the employer or of some one for whose acts or negligence he was responsible, the cause of death must be legally and judicially determined, and if it be determined that the death was caused by the wrongful act or negligence of the employer then the constitutional provision prohibiting any abrogation of the right of action to recover damages for wrongful death at once becomes effective and the rights of the minor heirs are protected. But if the death was accidental or without any wrong or negligence of the employer then the constitutional rights of the minor heirs are not involved or affected.

Garfield Smelting Co. v. Industrial Commission, —— Utah ——, 178 Pacific 57, p. 61.

WIDOW AND MINOR HEIRS—WAIVER.

The rights of minor heirs under the Industrial Commissions Act of Utah can not be determined by the mother's application for compensation under the act. Neither can she, by making such an application, waive the rights of the minor heirs; nor will she be deemed to have waived their rights unless such waiver is made in a judicial proceedings and in a manner known to the law affecting the rights of minors.

Garfield Smelting Co. v. Industrial Commission, —— Utah ——, 178 Pacific 57, pp. 61, 62.

APPLICATION TO MINOR HEIRS—INVALID IN PART.

The Industrial Commissions Act of Utah in so far as it provides compensation in cases where the death was caused by the wrongful act or negligence of the employer and where it assumes to limit the damages in such cases and attempts to impose a waiver on the rights of minor heirs, or the doctrine of election, is invalid, but this invalid part does not affect the other provisions of the act nor does it affect the provisions of the act in cases where the death was purely accidental.

Garfield Smelting Co. v. Industrial Commission, —— Utah ——, 178 Pacific 57, p. 62.

AWARD TO MINORS—WAIVER OF CONSTITUTIONAL RIGHTS.

The Industrial Commission can not legally make an award which is binding on minor heirs unless they have waived their constitutional rights in conformity with law, and the commission should not make an award in such cases until the rights of the heirs have been judicially determined and their waiver has been obtained in a proper judicial proceeding. If that has not been done, no employer could safely pay an award made by the commission until the general statute of limitations had fully run. But where it is determined or where it is admitted that the death was not due to the wrongful act or negligence of the mine operator, but was entirely accidental, then the constitutional rights of the minors are not involved or affected and no waiver is essential.

Garfield Smelting Co. v. Industrial Commission, —— Utah ——, 178 Pacific 57, p. 60.

WAIVER OF ACTION FOR DAMAGES.

The statute of Utah provides that the right of action to recover damages for wrongful death shall never be abrogated. The Industrial Commissions Act provides that heirs may elect to sue in actions at law or recover under the Industrial Commissions Act. The power thus given heirs to elect to sue for damages or receive compensation under the act is binding on adult heirs after an election has been made, and an award made by the commission pursuant to such election is not without jurisdiction and is not void. But in so far as the Industrial Commissions Act of Utah attempts to limit the amount of damages in case of death which arises in the course of the employment of the deceased and which was caused by the wrongful act or negligence of the employer, and in so far as the act attempts to enforce a waiver against minor children and in limiting the amount of recovery as against them in the face of the constitutional provision, it is invalid and not enforceable against such minor children.

Garfield Smelting Co. v. Industrial Commission, —— Utah ——, 178 Pacific 57, p. 60.

WORKMEN'S COMPENSATION ACT.

CONSTITUTIONALITY OF TEXAS ACT.

The Workmen's Compensation Act of Texas is not unconstitutional because it is compulsory as to an employee and takes from him his common-law remedy at the option of his employer.

Batson-Milholm Co. v. Faulk, —— Tex. Civ. App. ——, 209 Southwestern 837, p. 839.

CONSTITUTIONALITY OF STATUTE—REGULATION OF USE OF EXPLOSIVES.

The statute of Kansas (General Statutes 1915, section 6326) makes it unlawful to use dynamite or other detonating explosives in the preparation of blasts or shots in any coal mine in the State, except under rules and regulations agreed upon between the mine operators and the miners and approved by the State mine inspector and that the rules regulating the use shall be in writing. This act is not unconstitutional because it gives to mine operators and miners the power to make rules and regulations for the use of dynamite in coal mines if such rules and regulations are approved by the State mine inspector.

Richards v. Fleming Coal Co., —— Kans. ——, 179 Pacific 380, p. 381.

LEGISLATIVE POWER—DEPRIVING WORKMEN OF RIGHT TO SUE.

The legislature had the undoubted power to take away entirely the right of an injured employee to sue at common law, and it was clothed with equal authority to take it away upon such conditions as it saw fit to employ and to require the employer not only to become a subscriber within the specified meaning of that term but also to give the prescribed notice before he could shut an employee who otherwise possessed the right to sue off from the right to hale him into court in a suit for damages.

Batson-Milholm Co. v. Faulk, —— Tex. Civ. App. ——, 209 Southwestern 837, p. 841.

PURPOSE AND CONSTRUCTION—ACCEPTANCE BY EMPLOYERS.

The Texas Workmen's Compensation Act is a public one with incidental benefits to the wageworkers as a class in that it provides for compensation for all injuries received by them in the course of their employment without regard to the fault of the person causing the injury. The act provides for payment of compensation out of a fund which is created by contribution from employers in the way of premiums paid for policies of insurance. In order to afford relief to injured employees and to their dependents, it is necessary that these contributions should be readily and speedily made, and this result can be better obtained by voluntary action on the part of employers rather than involuntary obedience to a direct command. In order to induce the employers to accept the provisions of the act and to make the acceptance voluntary, he was deprived of all common-law defenses if he refused to accept its provisions and stripped of his common-law rights, thereby bringing to pass the same result that the act might have compelled by direct command.

Batson-Milholm Co. v. Faulk, —— Tex. Civ. App. ——, 209 Southwestern 837, p. 841.

ADMINISTRATION—DISCRETION BY COMPENSATION BOARD.

It was the purpose of the legislature of Pennsylvania to vest those who administered the Workmen's Compensation law with broad discretion in the ascertainment of facts.

Jensen v. Atlantic Refining Co., —— Pa. ——, 105 Atlantic 545, p. 546.

ELECTIVE FEATURE—PRESUMPTION—PLEADING—LIMITATION.

A complaint in an action by an injured miner for damages contained no allegation that the parties had elected not to operate under the Workmen's Compensation Act. The Workmen's Compensation Act expressly provides that every employer included shall be conclusively presumed to be subject to the act. After two years or more had elapsed from the date of the injury the plaintiff amended his complaint by inserting an allegation to the effect that before the injury the defendant had elected not to operate under the Workmen's Compensation Act. The amendment changed the nature of the action and made it subject to the two-year statute of limitations and barred a recovery.

Davis v. St. Paul Coal Co., —— Ill. ——, 121 Northeastern 181.

FAILURE OF EMPLOYER TO NOTIFY EMPLOYEES.

The Workmen's Compensation Act of Texas (Acts 1913) requires employers who become subscribers to give notice to all employees that he has arranged with the insurance association for payment of compensation for injuries. The failure of an employer to give the required notice relieves him of the statutory protection and an injured employee may sue as for common-law negligence.

Batson-Milholm Co. v. Faulk, —— Tex. Civ. App. ——, 209 Southwestern 837, p. 839.

See Farmers Petroleum Co. v. Shelton, —— Tex. Civ. App. ——, 202 Southwestern 194.

NOTICE BY EMPLOYER—RIGHT OF EMPLOYEE TO SUE.

The notice to be given by the employer as provided by the Texas Workmen's Compensation Act is not a condition precedent before bringing an employee within the terms of the act. The giving of the notice is not necessary to starting the statute in operation as between employer and employee i' the employer has otherwise availed himself of the provisions of the statute; but the performance by him of the affirmative act of becoming a subscriber by payment of the specified premium, required of the employer, without any act on the part of the employee, puts the statute into effect and covers the employee, except that the one who before had that right is not thereby deprived of his still subsisting privilege of suing for damages unless and until the notice required is also met by the employer.

Batson-Milholm Co. v. Faulk, —— Tex. Civ. App. ——, 209 Southwestern 837, p. 841.

APPLICATION OF STATUTE TO SHOT FIRERS.

A shot firer in a strip-pit coal mine comes within the provisions of the statute of Kansas that makes it unlawful for any person engaged in coal mining to use dynamite in the preparation of any blast or shot in a coal mine within the State except on conditions prescribed.

Richards v. Fleming Coal Co., —— Kans. ——, 179 Pacific 380, p. 382.

PROOF OF INJURY OR DEATH—CIRCUMSTANTIAL EVIDENCE.

The fact of an injury or death and that such injury or death occurred in connection with the employment within the meaning of the Illinois Workmen's Compensation Act may be shown by circumstantial evidence.

Smith-Lohr Coal Min. Co. v. Industrial Commission, —— Ill. ——, 121 Northeastern 231, p. 232.

RECOVERY FOR INJURIES.

A shot firer employed in a strip-pit coal mine and using dynamite in the preparation of a blast in violation of the statute of Kansas can not recover damages for injuries sustained by him in the explosion of dynamite with which he was working where it was necessary for him to prove its illegality as a part of his cause.

Richards v. Fleming Coal Co., —— Kans. ——, 179 Pacific 380, p. 382.

COMPENSATION PERIOD—INSTANTANEOUS DEATH.

Under the Workmen's Compensation Act of Pennsylvania (act of June 2, 1915, arts. 3 and 4), where an accident resulted in the instantaneous death of a miner, the period of compensation did not begin to run until 14 days after his death.

Rakie v. Jefferson & Clearfield Coal & Iron Co., —— Pa. ——, 105 Atlantic 638, p. 639.

CONTINUOUS EMPLOYMENT—AVERAGE EARNINGS.

Average daily earnings may be determined by adding together the actual earnings received during the period and after making the deductions required by the act, the remainder to be divided by the number of days in the period, less Sundays, legal holidays, and half holidays, and days the employee was prevented from working by sickness or through no fault of his own, in order to find the average wage for a working day.

Jensen v. Atlantic Refining Co., —— Pa. ——, 105 Atlantic 545, p. 546.

Rakie v. Jefferson & Clearfield Coal & Iron Co., —— Pa. ——, 105 Atlantic 638, p. 639.

WORKING DAY—DEFINED BY COMPENSATION BOARD.

The Workmen's Compensation Act of Pennsylvania did not define a "working day." The compensation board under the authority conferred upon it provided that "working days" shall mean the total number of days in a period of employment covered according to the calendar, less: (a) Sundays, (b) legal holidays, (c) half holidays each week, (d) days the employee was prevented from working through no fault of his own. The number of days that an employee was sick within the employment period may be deducted as included within the phrase "through no fault of his own."

Jensen v. Atlantic Refining Co., —— Pa. ——, 105 Atlantic 545, p. 546.

Rakie v. Jefferson & Clearfield Coal & Iron Co., —— Pa. ——, 105 Atlantic 638, p. 639.

WORKING DAY—MINE CLOSED BY LABOR DISPUTE.

In determining the number of working days of a miner for the purpose of computing his average earnings, the number of days that the mine was closed, due to a labor dispute, must be deducted from the entire number of calendar days, as the miner's idleness during these days was not due to any fault of his own.

Rakie v. Jefferson & Clearfield Coal & Iron Co., —— Pa. ——, 105 Atlantic 638, p. 639.

ALLOWANCE FOR HOSPITAL CHARGES—MAXIMUM AMOUNT.

The Workmen's Compensation Act of Illinois provides that compensation for an injury not resulting in death shall include a sum not exceeding $200 for medical, surgical, and hospital services, but for a period not longer than eight weeks. A payment of a greater amount and for a longer time must be regarded as having been made gratuitously or in the expectation of saving the life of the employee and reducing the total compensation for which the employer would eventually be liable, but otherwise the amount can not be allowed as a deduction in the absence of an agreement.

Crescent Coal Co. v. Industrial Commission, —— Ill. ——, 121 Northeastern 171.

DISTRIBUTION OF AWARD—AUTHORITY TO MAKE.

The Workmen's Compensation Act of Illinois provides that in case of voluntary payment by the employer the compensation may be paid either to the personal representative of the deceased or to his beneficiaries, and distributions by the personal representative, if paid to him, shall be on the order of the court appointing him. This statute applies only in cases where the employer voluntarily pays the compensation to the personal representative; but if there is a hearing and compensation is fixed by the Industrial Commission it must determine who is entitled to the compensation before it can determine the amount, and in such case the probate court has no jurisdiction to determine who is entitled to an award made by the Industrial Commission.

Smith-Lohr Coal Min. Co. v. Industrial Commission, —— Ill. ——, 121 Northeastern 231, p. 234.

POWER OF COURT TO REVIEW EVIDENCE.

Where the Industrial Commission has made an award for the death of a miner under the Illinois Workmen's Compensation Act (Hurds Revised Stats. 1917, chap. 48), a court in reviewing the evidence is not authorized to pass upon its weight, but can go no further than to see if there is any evidence tending to show that the death arose out of and in the course of the deceased miner's employment.

Smith-Lohr Coal Min. Co. v. Industrial Commission, —— Ill. ——, 121 Northeastern 231, p. 232.

See Big Muddy Coal Co. v. Industrial Commission, 279 Ill. 235, 116 Northeastern 662.

MINES AND MINING OPERATIONS.

ACTIONS—PLEADING AND PROOF OF NEGLIGENCE.

PROOF INSUFFICIENT—COURT DIRECTING VERDICT.

In an action by a miner for damages for injuries received in the mining operations due to the alleged negligence of the mine operator the court may direct a verdict for the defendant where the evidence of negligence on which recovery was sought was so indefinite and uncertain as not to warrant a verdict thereon.

Barna v. Gleason Coal & Coke Co., —— W. Va. ——, 98 Southeastern 158, p. 161.

AVERMENT OF FACTS SHOWING DUTY.

It is not sufficient in an action by a miner against a mine operator for damages for injuries to allege that it was the duty of the mine operator to do certain things, but the pleading must allege facts from which the law will raise the duty on the part of the mine operator.

New Staunton Coal Co. v. Fromm, —— Ill. ——, 121 Northeastern 594, p. 595.

GENERAL ALLEGATIONS OF NEGLIGENCE—NATURAL CAUSES.

In an action for the death of a miner the negligence of the operator as alleged consisted in laying the mine tracks so close together that loaded cars would not pass empty cars on a sidetrack without interference, and that the miner was killed by reason of a loaded car striking an empty car and driving it against him. The specific thing which caused the cars to interfere was not alleged and was probably not known to the complainant; but it was not the essential thing so long as the cause was natural, usual, and ordinary and which could and should have been obviated in laying the tracks.

Johnson v. Silver King Consol. Min. Co., —— Utah ——, 179 Pacific 61, p. 65.

ALLEGATIONS OF NEGLIGENCE—PROBABLE ACTS INCLUDED.

In an action for damages for the death of a miner the complaint averred negligence on the part of the mine operator in laying and maintaining the tracks in a tunnel so close together that loaded cars on the main track would not pass empty cars on the sidetrack without coming in collision. It also averred that the miner was killed as a result of such negligence by reason of a loaded car striking an empty car and driving it against the miner. This allegation of negligence was sufficiently broad to include any collision that might result either from the fact that the tracks were so close together that the cars would without other cause collide, or that they might collide by the tilting of the track or by a rock falling on the track and causing a car to tilt, or by the moving of the main track under the weight of the loaded cars, or by the speading of the rails, and if any one or all of these causes were as likely to have caused the cars to interfere in passing as that the interference was caused by the tracks being laid too close together to permit cars to pass without interference, then the allegation of negligence included all these. In laying the tracks ordinary prudence required that the things enumerated be kept in mind, as these things were liable to occur at any time.

Johnson v. Silver King Consol. Min. Co., —— Utah ——, 179 Pacific 61, p. 64.

PLEADING AND PROOF—VARIANCE—PROOF INSUFFICIENT.

A complaint in a miner's action for damages for injuries alleged that the defendant operator was negligent in failing to clean up a fall and in negligently failing to furnish a helper to assist the plaintiff to clean up and remove a fall and by reason of which the plaintiff was injured, and that the defendant operator was negligent in failing to remove the débris or obstruction caused by the fall of earth or coal in his mine chamber. The plaintiff's own evidence on the trial of the case showed that the débris and obstruction was entirely removed before the plaintiff received the injury of which he complained, and that at the time he was injured his room was in a normal condition, and at that time he had the right to perform his work as he pleased, and at the time of the injury he was mining under the coal with a pick and the removal of the dirt from under it caused the coal to come down, resulting in the injury complained of. The allegations of negligence were not supported by the proof, and the failure to remove the débris or fall was not the proximate cause of the injury.

Haney v. Texas & Pacific Coal Co., —— Tex. Civ. App. ——, 207 Southwestern 375, p. 381.

AMENDMENT OF PLEADING—STATUTE OF LIMITATIONS.

Where an original declaration or complaint for damages for injuries to a miner caused by the alleged negligence of the mine operator states a cause of action, though imperfectly and defectively, subsequent amendments filed after the statute of limitations has run will not be barred by the statute if the amendments amount to no more than a restatement in a different or better form of the cause of action originally declared upon.

New Staunton Coal Co. v. Fromm, —— Ill. ——, 121 Northeastern 594, p. 596.

AMENDMENT OF PLEADING—STATUTE OF LIMITATIONS.

A complaint in a common-law action by a miner for damages on the ground of the alleged negligence of the operator for injuries contained no allegation that the defendant had elected to operate under the Workmen's Compensation Act of Illinois. The act provides that mine operators shall be conclusively presumed to be subject to the act unless the contrary is made to appear. After a demurrer was sustained to the complaint and after more than two years from the date of the accident the complainant amended his complaint by inserting an allegation to the effect that the defendant mine operator had elected not to accept the provisions of the Workmen's Compensation Act. This amendment changed the nature of the action and made it subject to the two-year statute of limitations.

Davis v. St. Paul Coal Co., —— Ill. ——, 121 Northeastern 181.

ELEMENTS OF NEGLIGENCE.

In an action by a miner against a mine operator for damages for injuries on the ground of negligence it is necessary to allege and prove: (1) The existence of a duty on the part of the mine operator to protect the miner from the injury of which he complains, (2) the failure of the mine operator to perform that duty, and (3) an injury to the miner resulting from such failure.

New Staunton Coal Co. v. Fromm, —— Ill. ——, 121 Northeastern 594, p. 595.

SUFFICIENCY OF EVIDENCE.

A motor helper on an underground ore train was injured while standing on the running board in the performance of his duties. He alleged negligence in operating the locomotive without a headlight and with a defective running board, and in traveling at a dangerous rate of speed, and in piling timbers so near the track that insufficient space was left for the locomotive to pass. The jury was warranted in finding that the place where the accident occurred was not a reasonably safe one, or that the mine operator was negligent in failing to furnish an adequate running board or an adequate headlight on the motor, or that its train was moving at an excessive rate of speed at the time of the accident, and that the situation of timber in close proximity to the track was an extraordinary risk unknown to the employee and a danger concealed from him and one that could have been known to the operator by the use of ordinary care.

Inspiration Consol. Copper Co. v. Lindley, —— Ariz. ——, 177 Pacific 24, p. 26.

EVIDENCE EQUALLY BALANCED.

In an action by a miner for damages for injuries caused by the alleged negligence of the mine operator it is not improper to leave the matter with the jury where the evidence was equally consistent with the existence and the nonexistence of the negligence charged, as in such case the plaintiff has failed to establish the alleged negligence by a preponderance of the evidence.

Connors-Weyman Steel Co. v. Kilgore, —— Ala. ——, 80 Southern 454, p. 455.

OPINION EVIDENCE OF NONEXPERTS.

In an action by a miner for damages for injuries received in the course of the mining operations the opinion of the plaintiff to the effect that if he had been permitted to lay the track in the manner he desired he would not have received the injuries was not admissible in evidence. Nonexpert witnesses are not permitted to give an opinion on a matter where from the facts stated the jury is as competent as the witness to form an opinion.

Barna v. Gleason Coal & Coke Co., —— W. Va. ——, 98 Southeastern 158, p. 159.

PROOF INSUFFICIENT.

The evidence in an action for the death of a miner for the alleged negligence of the mine operator showed that the roof of the miner's working place was properly propped, and the mine boss inspected the place about two hours before the accident occurred and discovered no indications of danger, and there was no evidence to show any dangerous condition in the roof, and the evidence showed no indication of the presence of a loose rock or of danger from the roof falling. The evidence showed that the rock that did fall and kill the miner broke out and fell when the miner picked away the coal that supported the end extending into the working face. This evidence wholly failed to sustain the allegation of negligence on the part of the mine operator.

Snapp v. Steinbaugh, —— Ind. ——, 121 Northeastern 81.

ADMISSIONS IN PLEADING—EFFECT ON WEIGHT OF EVIDENCE.

In an action by a miner for damages for injuries he alleged in one paragraph of his complaint that the injury complained of was caused by the negligence of fellow servants; the other paragraph sought to recover damages on the ground of the negligence of the mine operator. The first paragraph of the complaint was dismissed and the cause tried on the second. The defendant, the mine operator, introduced in evidence the paragraph so dismissed as an admission on the part of the plaintiff that his injury was caused by the negligence of fellow servants, but the court trying the cause found for the plaintiff and that the injuries complained of were caused by the negligence of the mine operator. The court, on appeal, can not say that the admission in the pleading conclusively destroyed the plaintiff's cause of action on the second paragraph but must conclude that there was substantial testimony to uphold the finding of the trial court.

Forlow v. Athletic Min. & Smelting Co., —— Mo. App. ——, 209 Southwestern 117, p. 120.

PROOF OF NEGLIGENCE—EXPERT TESTIMONY.

The true test of the admissibility of testimony as to the condition of entries in a mine, tracks, and mine cars is not whether the subject matter is common or uncommon, or whether many persons or few have some knowledge of the matter, but the question is whether the witnesses offered as experts have any peculiar knowledge or experience not common to the world which renders their opinion, based on such knowledge or experience, any aid to a court or jury in determining the questions at issue.

National Fuel Co. v. McNulty, —— Colo. ——, 177 Pacific 979, p. 981.

FAILURE OF PROOF—PEREMPTORY INSTRUCTION—PRESUMPTION.

The trial of an action for damages for the death of a miner proceeded on the merits and a peremptory instruction was given the jury to return a verdict for the defendant. On appeal, in the absence of a bill of exceptions containing the evidence, it will be presumed that such peremptory charge was given because of the failure of the evidence to support the complaint.

Black v. Sloss-Sheffield Steel & Iron Co., —— Ala. ——, 80 Southern 794.

ACCIDENT NO PRESUMPTION OF NEGLIGENCE.

It is a general rule that the happening of an accident carries with it no presumption of negligence on the part of the employer.

Johnson v. Silver King Consol. Min. Co., —— Utah ——, 179 Pacific 61, p. 64.

DEATH FROM INHALING NATURAL GAS—FAILURE TO WARN.

A minor 19 years of age, without experience in working on oil and gas wells, employed as a roustabout, was ordered to build a platform around the casing of a well where the gas was escaping beneath the floor of the rig for the purpose of holding earth that was to be thrown and packed around the casing. He proceeded with the work and later was found lying face downward on the floor of the rig dead. On the day before he had been twice overcome by gas but each time after being revived returned to his work. The natural gas contained carbon dioxide, or choke damp, and carbon monoxide, or fire damp, and the choke damp, by reason of its greater density, remains closer to the earth and produces instant death, while the fire damp produces death by a much slower process. The evidence was sufficient from which a jury might have reasonably inferred that the deceased while stooping down to measure the floor of the rig for the purpose of ascertaining the dimensions of the platform which he was to construct beneath it came in contact with the strata of choke damp which caused his instant death. The evidence was also sufficient to justify the inference on the part of the jury that the operating company was negligent in failing to instruct and warn the deceased of the danger from inhaling the gas.

Silurian Oil Co. v. Morrell, —— Okla. ——, 176 Pacific 964, p. 966.
See Cash v. Kansas Oil Refining Co., —— Kans. ——, 176 Pacific 980.

OPERATION OF HOIST—INJURY—BURDEN OF PROOF.

In an action by a miner for injuries a complaint was sufficient, which averred that the defendant operated a mine and that the plaintiff and other miners were lowered through a shaft into the mine by means of a hoist operated with a steel cable attached to a large steel tub or cage; that while the plaintiff, with others, was being lowered into the mine by means of the hoisting machinery the agents and servants of the mine operator, who were in the exclusive control of the hoisting apparatus, so negligently conducted the operations that the tub or cage was caused to descend the shaft at an excessive and dangerous speed, and it was caused thereby to strike the bottom of the shaft with great force and violence, by reason of which the plaintiff was injured. These allegations were sufficient to cast upon the mine operator the burden of showing freedom from negligence under the maxim res ipsa loquitur.

Daugherty v. Neosho-Granby Min. Co., —— Mo. App. ——, 207 Southwestern 253, p. 254.

RELATION OF MASTER AND SERVANT.

RELATION AND LIABILITY—QUESTION OF FACT.

Whether or not the relation of master and servant exists is, under an issue of master and servant, a question of fact to be submitted to the jury.

Connors-Weyman Steel Co. v. Kilgore, —— Ala. ——, 80 Southern 454.

PROOF OF RELATION—BURDEN—PEREMPTORY INSTRUCTION.

In an action by a miner for damages for injuries caused by a fall from the roof of the mine, where there was some controversy as to whether the plaintiff's direct employer and the plaintiff were under the control and in the employ of the defendant, it was error for the court to give a peremptory instruction to the effect that the complainant was the defendant's servant without requiring the jury to accept and believe the plaintiff's evidence, although it was undisputed on this particular point.

Woodward Iron Co. v. Cooper, —— Ala. ——, 80 Southern 804, p. 805.

PROOF AND RIGHT OF RECOVERY.

Unless the relation of employer and employee exists at the time of an injury or the death of an employee there can be no recovery. But this relation may be proved by facts and circumstances, and the mode of payment of the wages of the employee is a circumstance in solving the question of whether the relation of master and servant exists, but it is not conclusive. So the furnishing of tools and appliances for work are circumstances that may be considered in determining whether the relation exists.

Standard Oil Co. v. Allen, —— Ind. App. ——, 121 Northeastern 329, p. 332.

BURDEN OF PROOF ON EMPLOYEE.

In an action by a miner for damages for injuries alleged to have been received in the course of his employment and as the employee of the mine operator, the burden of proof is on the complainant to show that he was an employee or a servant of the defendant mine operator, as alleged in his complaint.

Woodward Iron Co. v. Cooper, —— Ala. ——, 80 Southern 804, p. 805.

SCOPE OF EMPLOYMENT—CHANGE OF WORK.

A miner was employed and working in a mine as a lineman and while so engaged the mine foreman ordered and directed him to work as a general utility man and that as such he had performed every kind of service in the mine except shoveling. While acting as such utility man he was within the scope of his employment and the relation of master and servant was not suspended, and the mine operator was liable in damages for injuries received while the miner was so working.

Forlow v. Athletic Min. & Smelting Co., —— Mo. App. ——, 209 Southwestern 117, p. 120.

RELATION SUSPENDED—VOLUNTARY ABANDONMENT OF EMPLOYMENT.

A servant or employee who voluntarily and without necessity abandons the employment for which he was engaged and steps outside of the line of his duty suspends the relation of master and servant. A servant in order to hold the master liable must be engaged in the service of the master and not be acting for some purpose of his own, and if he during the employment goes without necessity to a place where in his line of service he should not be and is there injured he can not recover.

Forlow v. Athletic Min. & Smelting Co., —— Mo. App. ——, 209 Southwestern 117, p. 120.

NEGLIGENCE OF OPERATOR.

ACTIONABLE NEGLIGENCE.

A mine operator may be liable for negligence to a motor helper injured while standing on the footboard of a locomotive motor on the ground either for a failure to furnish a safe and adequate footboard or an adequate headlight on the motor, or that the train was run at an excessive speed on a sharp curve and that timbers were piled in such close proximity to the track as to constitute an extraordinary hazard.

Inspiration Consol. Copper Co. v. Lindley, —— Ariz. ——, 177 Pacific 24, p. 26.

PRESUMPTION AND PROOF.

As between an employer and an employee no presumption arises from the mere fact of injury unless the circumstances attending the injury were sufficient to establish negligence without any direct proof thereof.

Coosa Portland Cement Co. v. Crankfield, —— Ala. ——, 80 Southern 451, p. 453.

QUESTION OF FACT.

A miner was directed by the mine foreman to pass through a dark tunnel and while so passing through the tunnel he was struck by cars loaded with coal that were run without lights or signals. The question of the mine operator's negligence under such circumstances was one of fact to be determined by the jury in the miner's action for damages.

Ford v. Philadelphia & Reading Coal & Iron Co., —— Pa. ——, 105 Atlantic 885, p. 886.

ACCIDENT AS PROOF OF NEGLIGENCE.

Where machinery or instrumentalities producing an injury were under the management of a mine operator or his servants and the accident complained of was such that in the ordinary course of things would not have happened if those having the management used proper care, the accident itself affords reasonable evidence, in the absence of explanation by the mine operator, that the accident arose from want of care.

Daugherty v. Neosho-Granby Min. Co., —— Mo. App. ——, 207 Southwestern 253, p. 254.

UNUSUAL ACCIDENT—INJURY NOT ANTICIPATED.

Miners were attempting to unchoke a blast hole and after unsuccessful efforts with a pole they procured and used at the direction of the mine superintendent a drill in the process of unchoking the hole. While so engaged the powder exploded, filling the eyes of one miner with smoke and dust and dirt, and in fleeing from the place of the explosion he ran over a high bank and was injured by the fall. According to some evidence, the use of a drill for such a purpose was common, and it was not regarded as dangerous, and that in the long experience of witnesses such an accident had never occurred. The mine operator would not be guilty of actionable negligence if the accident was of such an unusual character as not to be anticipated on the part of the mine operator in the exercise of ordinary care, and the plaintiff would not be entitled to recover as the proof would not make such conduct actionable negligence.

Sloss-Sheffield Steel & Iron Co. v. Thomas, —— Ala. ——, 80 Southern 69, p. 71.

PROOF AND PRESUMPTION—CIRCUMSTANTIAL EVIDENCE.

A plaintiff is not bound to prove more than enough to raise a fair presumption of negligence on the part of a defendant and of resulting injury to himself. When he has done this, he is entitled to recover unless the defendant produces evidence sufficient to overcome this presumption. If the facts proved make it probable that the defendant violated his duty, it is then for the jury to decide whether he did so or not; otherwise it would be a denial of the value of circumstantial evidence. However, the facts proved must be more consistent with the negligence of the defendant than with the absence of it, but they need not be inconsistent with any other hypothesis. Evidence of negligence need not be direct and positive, but may be circumstantial. Negligence is susceptible of proof by evidence of circumstances bearing more or less directly on the fact of negligence, and it is sufficient if it satisfies an unprejudiced mind.

Johnson v. Silver King Consol. Min. Co., —— Utah ——, 179 Pacific 61, p. 65.

PROOF—BREACH OF DUTY—VIOLATION OF STATUTE.

A tool sharpener while engaged in and about the drilling or construction of an oil well was killed by reason of an explosion of gas escaping from a well. In an action to recover damages it was alleged that the oil operator negligently and carelessly permitted large volumes of natural gas to escape from the well and from the earth surrounding it contrary to the laws of the statute to such an extent that the atmosphere around the well became impregnated and saturated with gas so as to be dangerous, and that the defendant failed to use proper care to prevent the existence of such condition, and that by reason of such negligence an explosion occurred. In an action to recover evidence of acts amounting to negligence may be shown, though such acts may also show a violation of a statute enacted for the benefit of the public generally and not for the class of persons to which the deceased employee belonged. The passage of the statute did not affect the common-law duty owing by the oil well operator to the tool sharpener nor change the liability arising from a negligent breach thereof resulting in his death.

Slick Oil Co. v. Coffey, —— Okla. ——, 177 Pacific 915, p. 916.

COMMON-LAW REMEDY—BASIS.

The common-law remedy of an employee against his employer to recover damages for personal injuries received depends wholly on the failure of the employer in performing a duty he owes to the employee. The basis of all such actions is the employer's negligence.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 177 Pacific 29, p. 30.

COMBINATION OF CAUSES—UNCERTAINTY.

There can be no recovery under a charge of negligence where there are several causes that may have brought about injury for some of which the employer is liable and for some of which he is not, and it can not be assumed that the negligence of the employer was the real cause when there was no satisfactory foundation in the testimony for such a conclusion.

Johnson v. Silver King Consol. Min. Co., —— Utah ——, 179 Pacific 61, p. 64.

EXERCISE OF CARE—EMPLOYMENT OF CUSTOMARY METHODS AND APPLIANCES.

An employer can not as a matter of law be said to be exercising ordinary care merely because he uses methods and appliances customarily employed by others in the same character of work, nor to be without such care solely because he fails to adopt the latest and most improved devices known. Whether or not an employer under such circumstances exercised ordinary care was a question of fact to be left to a jury.

Batson-Milholm Co. v. Faulk, —— Tex. Civ. App. ——, 209 Southwestern 837, p. 843.

MINER'S WANT OF KNOWLEDGE OF DANGER—FAILURE TO WARN.

A miner was employed by a mine operator and put to work in a mine with which he was wholly unacquainted. He was directed to work as a miner on the sixth set of a stope that was timbered. The seventh set was above him and not timbered, but the timberman was working on the seventh set taking down material preparatory to timbering it, and lagging was over the sixth set to catch the falling material. No lights were in the stope except the ordinary carbide lamps used by the miners, and from the miner's position he could not see the roof from the seventh stope, where the fall occurred. The miner was directed to run the machine drill on the sixth set without any suggestion or instruction as to the conditions surrounding him. While so at work the miner was directed to take his machine to the seventh set and deliver it to the timberman for the purpose of making tenants preparatory to setting timbers. As the miner handed the machine to the timberman the material fell from the face of the stope, producing the injuries complained of. The miner was not previously warned of the dangerous condition of the roof of the stope at the seventh set, although the timberman and the mucker boss both knew and appreciated the fact that there was danger of loose rock falling from the face of the stope. Under these facts the mine operator was negligent in not warning the miner of the existing danger.

Miller v. Utah Consol. Min. Co., —— Utah ——, 178 Pacific 771, p. 773.

FIRE FROM BURNING OIL—PROXIMATE CAUSE.

The owners of oil leases permitted crude oil to escape from their separate leases into a creek where it became ignited and was carried by the wind and the stream and burned and destroyed a barn on the banks of the stream. Negligence to be the proximate cause of an injury must be such that the injury was the natural and probable cause of the negligence or wrongful act and that it ought to have been foreseen in the light of attendant circumstances. The act of the lease owners in negligently discharging crude oil, a highly inflammable substance, into the stream above complainant's barn was the proximate cause of the injury, for the reason that the injury done by the floating oil ought to have been foreseen in the light of all the surrounding circumstances. The wrongdoers can not be heard to say that they did not know that crude oil was inflammable or that they had no reason to believe that the crude oil, which they negligently allowed to flow into the creek, would become ignited and be driven by the wind and natural flow of the stream upon complainant's premises. The question is not whether such an act would produce a conflagration in a majority of cases but whether it has a natural tendency to produce such a result.

Northup v. Eakes, —— Okla. ——, 178 Pacific 266, p. 269.
See Santa Rita (The), In re, 176 Federal 890.
    Kuhn v. Jewett, 32 N. J. Equity, 647.
    Brennan Construction Co. v. Cumberland, 29 App. D. C. 554.
    Rock Oil Co. v. Brumbaugh, 59 Ind. App. 640, 108 N. E., 260.
    Texas Co. v. Clarke & Co. —— Tex Civ. App. ——, 182 Southwestern 351.

FIRE FROM OIL WELL.

Several persons and corporations owning and operating separate oil and gas leases negligently permitted the crude oil to escape from their respective leases into a creek, whereby it became ignited and was carried by the wind and natural flow of the stream and the flames came in contact with and burned and destroyed a barn situated upon the stream, together with its contents. The owners of such oil and gas leases were jointly and severally liable for the wrongdoing, and the injured party might at his option maintain an action to recover against one or all of the persons contributing to the injury.

Northup v. Eakes, —— Okla. ——, 178 Pacific 266, p. 268.

FAILURE TO TIMBER—QUESTION OF FACT.

The question as to whether or not a mine operator was negligent in failing to timber the face of a stope before a miner was directed for the first time to work at the particular place under existing conditions and circumstances was a question of fact to be determined by the jury in an action by the miner for damages for injuries.

Miller v. Utah Consol. Min. Co., —— Utah ——, 178 Pacific 771, p. 774.

INJURY TO MULE DRIVER—SAFE PLACE—OPINION EVIDENCE.

A mule driver in a coal mine was injured while driving cars in the mine from the mine rooms along an entry to the bottom of the shaft from which the coal was hauled to the surface. In an action for damages the negligence complained of was that the entry was insufficiently lighted; that the grade of the entry was too steep; that the sand rails were inadequate to sufficiently check the speed of the car while rounding a curve; that the frame of a door through which the track passed was built too close to the rails to permit a safe passage; and that no warning of these hazards had been given the employee. On the trial of such action the testimony of an expert coal miner was admissible to show that the place in which the driver worked was not a reasonably safe place. The roadways and entries of a mine and their adaptability to the use intended are not matters of common knowledge and are proper subjects for expert opinion.

National Fuel Co. v. McNulty, —— Colo. ——, 177 Pacific 979, p. 981.

NEGLIGENT INSTRUCTIONS OF FOREMAN.

A mine operator may be liable for injuries to a miner caused by negligent instructions given by the mine foreman to the miner. An instruction by a court in the trial of an action for damages to the effect that the foreman negligently instructed the miner to occupy a certain dangerous position is not erroneous in that he should have directed the jury to find whether or not the instruction was negligent in view of the fact that the jury was required to find facts which, if true, constituted negligence on the part of the mine operator.

Medley v. Parker-Russell Min., etc., Co., —— Mo. App. ——, 207 Southwestern 887, p. 890.

SCOPE OF EMPLOYMENT—IMPLIED COMMAND OF EMPLOYER.

An inexperienced person was employed as a shoveler in a coal mine. When he went to work he found other shovelers engaged in the same line of work and also in breaking or "popping" bowlders with dynamite in the presence of the mine foreman, and the fact that there was no one there ready to do the work of breaking the bowlders for him was an implied command for him to break bowlders with dynamite and was sufficient to fix the liability of the mine operator to the same extent as if the shoveler had been specially directed to use the dynamite.

Batesel v. American Zinc, Lead & Smelting Co., —— Mo. ——, 207 Southwestern 742, p. 746.

FAILURE TO WARN—QUESTION OF NEGLIGENCE.

A mine operator who knows the great danger to an inexperienced miner in doing a particular kind of work can not shut his eyes and assume, without any knowledge on the subject, or attempting to acquire any, that every adult man in possession of his ordinary faculties has the skill and experience to do that work which can be done with safety only by the few who have by experience and training acquired such knowledge. The fact that a danger is such that the work can be done safely only after experience and training is a fact that must be taken into consideration in determining the mine operator's negligence in directing or permitting an inexperienced miner to engage in such extrahazardous occupation.

Batesel v. American Zinc, Lead & Smelting Co., —— Mo. ——, 207 Southwestern 742, p. 744.

OPERATION OF MINE CARS—UNSAFE TUNNEL TRACKS—DANGERS ANTICIPATED.

A miner working in a tunnel was killed by reason of a loaded mine car striking an empty car standing on a sidetrack and driving it from the track against the miner. The mine operator's negligence as alleged consisted in laying and maintaining the rails of the tracks so close together that loaded cars on one track would not pass empty cars on the other track without striking them and that the negligence of the mine operator in so laying and maintaining the tracks resulting in a collision was the direct cause of the miner's death. The testimony did not show definitely and directly the cause of the accident but the circumstances and conditions as described were sufficient to justify the inference that the accident did happen and the death was caused by the loaded car striking the empty car and driving it against the miner. The mine operator might be liable under the charge of negligence for so laying and maintaining the tracks if there should be a collision of the cars resulting from any cause reasonably anticipated, such as the tilting of the track, or a rock falling on the track and causing the car to tilt, or by the moving of the main track under the weight of the loaded cars, or by the spreading of the rails. If either one or all of these causes were just as likely to have caused the cars to interfere in passing as that the interference was caused by the tracks being laid too close together to permit the cars to pass without interference, then all of these causes were included within the allegation that the tracks were in fact laid too close together to permit cars to pass without interference.

Johnson v. Silver King Consol. Min. Co., —— Utah ——, 179 Pacific 61, p. 64.

ALIEN MINER—RECOVERY FOR INJURIES.

Proof that the miner suing for damages for injuries in a mine was born in Austria, but had resided in this country since 1904, does not prove alienage and though an alien, if residing in this country for such length of time and conducting himself properly he was not precluded from maintaining suits in the courts to vindicate his rights. If the plaintiff was an alien enemy the question should be raised by pleadings and can not be established by an admission on cross-examination that he was born in Austria.

Barna v. Gleason Coal & Coke Co., —— W. Va. ——, 98 Southeastern 158, p. 162.

DUTY OF OPERATOR TO FURNISH SAFE PLACE.

CARE REQUIRED OF EMPLOYER.

It is the duty of a coal mine operator to use reasonable care to provide a miner a reasonably safe place in which to work.

New Staunton Coal Co. v. Fromm, —— Ill. ——, 121 Northeastern 594, p. 595.
Thompson v. Standard Oil Co., —— N. C. ——, 98 Southeastern 712, p. 713.

The duty rests upon a mine operator to use ordinary care to make the miner's place of work reasonably safe.

Henness v. Pend D'Oreille Min. & Reduction Co., —— Idaho ——, 178 Pacific 836, p. 837.

SAFE PLACE—MEANING.

A safe place is a relative term; and to furnish such a place in which employees may work the duty of the employer is declared as limited to the reasonable care and skill necessary to have the place reasonably safe for the purpose for which it was designed, used, or operated, provided the place is reasonably safe for the employee to work in the exercise of due care in the discharge of the duties of his employment. But the degree of care and skill exacted of the employer is that it must be proportionate to the dangerous nature of the mines, instruments, and machinery used.

Coosa Portland Cement Co. v. Crankfield, —— Ala. ——, 80 Southern 451, p. 452.

INSTRUCTION AS TO DUTY OF MINE OPERATOR—CONSTRUCTION.

In an action by a miner for damages for injuries occasioned by a fall from the roof the court instructed the jury to the effect that it was the duty of the mine operator to use reasonable and ordinary care to provide the miner with a safe place in which to do his work; and that it was the duty of the operator to make the miner's place of work reasonably safe and that the miner had the right to assume that this duty had been performed. These instructions are not susceptible of construction that the jury might assume that the mine operator was an insurer and that it was his duty to furnish an absolutely safe place for the miner to work; but the court meant to tell the jury that it was the duty of the mine operator to use ordinary care to furnish the miner a reasonably safe place to work.

Miller v. Utah Consol. Min. Co., —— Utah ——, 178 Pacific 771, p. 776.

INSTRUCTION—"MANNER" OF USE OF STEPS.

A miner was injured by the fall of one of a series of steps by which the miners ascended a travelingway. The steps were supported at one end by props and at the other by being inserted into the wall of coal. The particular step causing the injury by its falling was not inserted sufficiently deep into the coal to give it a secure support. The injured miner had no knowledge of the insecurity of the step by reason of its not being inserted a sufficient depth into the coal bank. On the trial the court instructed the jury to the effect that the plaintiff was fully acquainted with the steps "and the manner that they were fastened and secured." The word "manner" as used by the court was susceptible to two meanings, one referring simply to the general construction of the steps and the other including also the depth of their insertion into the coal. As referring to the former meaning the instruction would be accurate, but if given the latter it would be inaccurate and misleading, as there was nothing to show that the plaintiff knew how deep the steps were inserted into the coal.

Chamberaeti v. Susquehanna Coal Co., —— Pa. ——, 105 Atlantic 277, p. 278.

FAILURE TO FURNISH—LIABILITY.

It is the duty of a coal-mine operator to exercise care to provide a reasonably safe place for a miner in which to do the work assigned him, and a mine operator may be liable for injuries to a miner while passing through a dark tunnel by direction of the foreman caused by being struck by loaded cars passing through the tunnel without lights or signals on the theory that the mine operator did not furnish a safe place.

Ford v. Philadelphia & Reading Coal & Iron Co., —— Pa. ——, 105 Atlantic 885, p. 885.

MINER'S ASSUMPTION OF EMPLOYER'S DUTY.

It is the duty of a mine operator to furnish a reasonably safe place for a miner to work, and the miner has the right to assume that the mine operator has fulfilled his duty.

Abelstad v. Johnson, —— N. Dak. ——, 170 Northwestern 619, p. 620.

A miner in entering the employment of a mine operator has a right to assume that the operator has exercised ordinary care to provide him with a reasonably safe place in which to work.

Miller v. Utah Consol. Min. Co., —— Utah ——, 178 Pacific 771, p. 774.

Henness v. Pend D'Oreille Min. & Reduction Co., —— Idaho ——, 178 Pacific 836, p. 837.

UNSAFE TRACKS IN MINE TUNNEL—INJURY FROM OPERATION OF CARS.

A miner assisting in the construction of a tunnel was killed by reason of a loaded car, as it was being hauled out, striking an empty car on the sidetrack and thrusting it against and pinning him between the car and the side of the tunnel. The negligence charged was the failure of the mine operator to furnish a safe working place in that the rails of the main track and of the sidetrack were so close together that the loaded car would not pass an empty car without striking it. The proof of the particular accident was indefinite and the fact of the loaded car striking the empty car and driving it against the miner was an inference. But negligence in failing to maintain a safe place might be inferred if the tracks were so close together that the cars might collide, and a loaded car might push an empty car off the track and against the tunnel side on any one of the several theories advanced by the mine operator in his attempt to show that the accident might have happened in a number of different ways for the purpose of avoiding liability under the rule that where there are a number of causes that might have brought about the injury and for some of which the employer was not liable there could be no recovery.

Johnson v. Silver King Consol. Min. Co., —— Utah ——, 179 Pacific 61, p. 64.

EXCEPTION—MINER'S WORKING PLACE.

It is the duty of a mine operator to make and maintain every part of the mine reasonably safe, and the operator is absolved from the performance of that duty as against a miner only at the particular place where the miner is engaged in his regular work, but not so with respect to any other place in the mine.

Miller v. Utah Consol. Min. Co., —— Utah ——, 178 Pacific 771, p. 774.

DRILLING OIL WELLS—SAFETY FROM ESCAPING GAS.

An oil company had absolute control of all that part of an undertaking which related to the handling of escaping gas and the stopping and restricting the flow thereof. The oil company employed an independent contractor to drill an oil and gas well and by express agreement undertook to handle and care for the escaping gas. Under such circumstances it was bound by its original duty and by its express agreement to an employee of the independent contractor, and its duty to such employee was the same as though it had originally undertaken the work of drilling without the intervention of the independent contractor.

Slick Oil Co. v. Coffey, —— Okla. ——, 177 Pacific 915, p. 917.

EVIDENCE OF GENERAL CONDITIONS AFTER INJURY ADMISSIBLE.

A miner while pulling a pillar in a mine was injured by falling coal and rock. The injury as alleged resulted from the falling of the roof some distance from the miner and extending to the portion over or near him, resulting from a failure to pick down the roof or have it propped at the point where it first broke and started to fall. Under this theory it was proper on the trial of the cause to admit evidence showing that coal or rock, other than that at the pillar where the complainant was injured, had fallen. The issue under the plaintiff's theory was whether the fall of coal was confined to the pillar at which he was working, and a competent witness examining the roof after the fall could testify whether the fall was confined to the pillar at which the plaintiff was working.

Woodward Iron Co. v. Cooper, —— Ala. ——, 80 Southern 804, p. 805.

DUTY TO PROVIDE SAFE APPLIANCES.

CARE REQUIRED.

An employer of labor in the exercise of reasonable care is required to provide an employee with implements, tools, and appliances suitable for the work in which he is engaged.

Thompson v. Standard Oil Co., —— N. C. ——, 98 Southeastern 712, p. 713.

A coal mine operator is bound to use reasonable care to provide a miner with reasonably safe machinery and implements with which to discharge his duties.

Long v. Pocahontas Consol. Collieries Co., —— W. Va. ——, 98 Southeastern 289, p. 292.

A mine operator owes his miners and employees the duty to supply appliances reasonably suitable for the purposes in view and in the selection of which reasonable care and skill has been exercised.

Connors-Weyman Steel Co. v. Kilgore, —— Ala. ——, 80 Southern 454, p. 456.

CARE IN FURNISHING AND INSPECTING APPLIANCES.

It is the duty of an oil-well driller to use ordinary care in both furnishing its employees reasonably safe appliances with which to work and in making periodic inspection thereof.

Batson-Milholm Co. v. Faulk, —— Tex. Civ. App. ——, 209 Southwestern 837, p. 843.

INSUFFICIENT APPLIANCES—PROXIMATE CAUSE OF INJURY.

A mine operator provided and maintained a wooden pole across the entry of the mine to prevent loose cars from running back into the mine and that had to be removed before the cars entered the mine. In some similar mines a "derailing switch" was used to keep the cars from running back into the mine. The negligence charged in an action for the death of a miner was the operator's failure to provide safe means to prevent the mine cars from running back into the mine. But the proof did not show that the mine operator was negligent in providing or maintaining the wooden pole across the entry of the mine instead of a derailing switch or other device, and there was no proof to show that the death of the miner would not have occurred as and when it did had such derailing switch been installed and in use at the mine at the time. The burden of proof was upon the complainant to show by an unbroken sequence of cause and effect that the negligence alleged was the proximate cause of the intestate's injury and death.

Connors-Weyman Steel Co. v. Kilgore, —— Ala. ——, 80 Southern 454, p. 455.

USE OF OLD APPLIANCES—ADOPTION OF NEW IMPROVEMENTS.

A mine operator is not required to adopt machinery and appliances of any particular kind and character, nor to provide the best and safest to be had, nor employ every device, although greater immunity from dangers would be thereby assured. His duty is only to discontinue the old and insecure and to adopt such improvements and advancements as are in ordinary use by prudently conducted mines engaged in like business and surrounded by like circumstances.

Connors-Weyman Steel Co. v. Kilgore, —— Ala. ——, 80 Southern 454, p. 455.

DEFECTS OBVIOUS.

A mine operator will be liable to a miner for injuries sustained by him on account of the defects in machinery and implements furnished by the operator, unless the defects occurred in the use thereof by the miner is slight and easily remedied by him; or unless it appears that under all the circumstances the defects were open and apparent and that the miner should by the reasonable use of his faculties discover the defects in time to avoid the injury.

Long v. Pocahontas Consol. Collieries Co., —— W. Va. ——, 98 Southeastern 289, p. 292.

See Texas Co. v. Hearn, —— Ga. ——, 98 Southeastern 419.

INSUFFICIENT APPLIANCE—LIABILITY.

A boy seventeen years of age was employed at a colliery as a driver. His duty was to take empty cars from the turnout within the mine to the face of the gangway and return the cars when reloaded to the turnout. While unloading timbers the heavy gate of the car was elevated and kept in its position by an iron bar used for that purpose. On the occasion of the injury no bar was used but in its stead a wet wedge, by reason of the insufficiency of which the gate fell and injured the boy. The failure to use an iron bar can not be ascribed to the negligence of fellow servants where no iron bar had been provided by the mine operator, and the operator's negligence in failing to furnish the proper appliance was sufficient to render him liable for the injury to the boy.

Sebastian v. Philadelphia & Reading Coal & Iron Co., —— Pa. ——, 105 Atlantic 887, p. 888.

FAILURE TO INSPECT—PLEADING AND PROOF.

An employee of an oil-well driller while assisting in drilling a well was injured by the fall from the top of the derrick of a sheave or pulley. The negligence charged consisted in the failure of the employer to inspect the sheave or pulley and in negligently permitting it to become loose in its axle and in permitting the axle to work out of its groove in the crown block thereby causing the sheave to fall upon and injure the employee. The allegations of negligence were also broad enough to include the way the sheave and axle were attached to or placed on the crown block. On the trial of the action for damages the evidence showed that the oil drilling company had made no inspection for four days to determine whether the sheave was loose upon the axle before the accident, and no inspection of any sort was made since early morning of the next preceding day. Under the allegations of the complaint the proof was sufficient to sustain a finding of negligence on the part of the oil drilling company.

Batson-Milholm Co. v. Faulk, —— Tex. Civ. App. ——, 209 Southwestern 837, p. 843.

DEFECTIVE BRAKE ROD—LATENT DEFECTS.

A coal mine operator is not liable in damages to an employee injured by the breaking of a defective brake rod where the defect was latent and could not be discovered by ordinary inspection.

Desbia v. Monongahela R. Co., —— Pa. ——, 105 Atlantic 55.

DEFECTIVE CABLE—MINER'S ASSUMPTION OF EMPLOYER'S PERFORMANCE OF DUTY.

It is the duty of a mine operator to furnish reasonably safe appliances for a miner to work and a miner may assume that the mine operator has fulfilled this duty. Under this rule a mine operator is liable for injuries resulting from the use of defective and worn cables in hauling loaded cars out of a mine.

Abelstad v. Johnson, —— N. Dak. ——, 170 Northwestern 619, p. 620.

UNCHOKING DRILL HOLE—USE OF STEEL DRILL—OPINION OF WITNESS.

A witness who had had many years' experience with powder in drilling holes through earth and rock and as to the method and danger of unchoking the hole with the use of a steel drill may give his opinion as to whether or not it was safe or unsafe to use a steel drill in unchoking a blast hole.

Sloss-Sheffield Steel & Iron Co. v. Thomas, —— Ala. ——, 80 Southern 69, p. 71.

EVIDENCE OF CONDITION AFTER INJURY NOT ADMISSIBLE.

A miner was injured by a fall of coal and rock from the roof of his working place. In an action by the miner for damages for the injuries, it was not proper for a witness to describe the conditions in the miner's working place when he first saw it after the injury, in the absence of evidence showing that the conditions were unchanged between the time the witness saw it and the time of the accident.

Woodward Iron Co. v. Cooper, —— Ala. ——, 80 Southern 804, p. 805.

MINER'S WORKING PLACE—SAFE PLACE.

DUTY OF MINER AS TO WORKING PLACE.

It is the duty of a miner to take notice of and avoid obvious defects in his working place.

Henness v. Pend D'Oreille Min. & Reduction Co., —— Idaho ——, 178 Pacific 836, p. 837.

DUTY OF MINER—INSPECTION.

A miner is charged only with the duty of inspecting and making reasonably safe the place where he works. He has nothing to do with inspecting any other portion of the mine or maintaining it safe. As to his particular working place the miner absolves the mine operator from the duty of making it safe, but not so with respect to other places in the mine.

Miller v. Utah Consol. Min. Co., —— Utah ——, 178 Pacific 771, p. 774.
See Urich v. Apex Min. Co., —— Utah ——, 169 Pacific 263.

MINER NOT REQUIRED TO INSPECT.

A miner ordinarily is not employed or directed to make the place of his employment safe in the sense that it is his duty to discover and remedy latent defects.

Hennes v. Pend D'Oreille Min. & Reduction Co., —— Idaho ——, 178 Pacific 836.

MAKING DANGEROUS PLACE SAFE—DUTY TO WARN.

It is the duty of a master to warn an inexperienced miner of the hidden and latent dangers of his employment and this rule applies as well to servants who are engaged in making a dangerous place safe as to any other class of employees. If an employee engaged in an occupation attended with danger is left by his employer without knowledge of latent dangers and suffers thereby the employer is liable in damages for the injuries.

Silurian Oil Co. v. Morrell, —— Okla. ——, 176 Pacific 964, p. 967.

SAFETY—DUTY OF OPERATOR—DETAILS OF WORK.

A miner employed to haul fire clay and whose duties required him to assist in loading his wagon by shovelling the clay was directed by the foreman to take a position near an embankment and was engaged in shovelling up the loose clay when he was killed by a fall of the embankment. The foreman had been warned by the superintendent that the particular bank was dangerous and liable to fall; and in the meantime the foreman himself had rendered the embankment more dangerous by picking at its base. The foreman failed to go upon the top of the embankment to look for cracks and failed to warn the driver of the danger, but on the contrary, specifically assigned the driver to the dangerous position. Under these circumstances the mine operator can not escape liability on the ground that it was not his duty to guard the details of the work and that the scene of the work was constantly changing and the dangers that arose were necessarily incident to the execution of the work.

Medley v. Parker-Russell Min., etc., Co., —— Mo. App. ——, 207 Southwestern 887, p. 889.

DUTY TO PROP—PROOF—OPINION OF WITNESS.

In an action by a minor for damages for personal injuries caused by a fall of rock from the roof, it was proper to permit the miner to describe fully and in detail his working place, but it was not proper to permit the miner to express an opinion as to his duty to prop or inspect the roof as this was a question of law.

Stone v. Pratt Consol. Coal Co., —— Ala. ——, 80 Southern 882.

INSPECTION—SOUNDING ROOF—SECOND TRIAL AND APPEAL—LAW OF CASE.

The evidence in the first trial and appeal and in the second trial and appeal was to the effect that the only practical way of determining the condition of the roof of the mine was by soundings made for that purpose and that the fact that the miner used a pick for the purpose of making a hole in the roof for the jack was sufficient to detect the condition of the roof. The testimony being substantially the same the opinion of the first case upon the particular issue must govern and the trial court on the second trial was required to abide by the decision on the first appeal.

Consolidation Coal Co. v. Bailey, —— Ky. ——, 208 Southwestern 762, p. 763.

DUTY TO WARN OR INSTRUCT.

INEXPERIENCED MINER—INSTRUCTIONS AS TO DANGERS.

It is the duty of a master who has actual knowledge that the employee is inexperienced in the work for which he is employed to use reasonable care in cautioning and instructing such servant in respect to the dangers he will encounter and how best to discharge his duties.

Silurian Oil Co. v. Morrell, —— Okla. ——, 176 Pacific 964, p. 967.

INEXPERIENCED MINER—EXTENT OF INSTRUCTIONS.

In the matter of a mine operator instructing an inexperienced miner as to abnormal and extraordinary risks and hazards it is not sufficient that the employer merely informs the miner that there is danger, or the source from which the danger comes, but there must be such instruction as will enable him to avoid the danger. The warning must be accompanied with such explanation as will enable the miner to understand it and when required to perform dangerous work the operator must instruct him fully as to the safest mode of doing such work and warn him of liability to special danger of which he was not aware.

Batesel v. American Zinc, Lead & Smelting Co., —— Mo. ——, 207 Southwestern 742, p. 744.

A master's culpability in failing properly to warn a servant may reasonably be inferred from evidence which indicated that the servant although he had been warned in general terms as to the danger of the work had received no special warning in regard to the particular danger to which the injury complained of was due, or no explicit instructions as to the proper manner of avoiding it. Under the circumstances the information which the master thus failed to communicate was necessary to enable the servant to obtain an intelligent comprehension of the danger.

Silurian Oil Co. v. Morrell, —— Okla. ——, 176 Pacific 964, p. 967.

SUFFICIENT WARNINGS—QUESTION OF FACT.

The question whether or not a miner should have been warned is always for the jury where the evidence is fairly susceptible of the construction that the peril to which his injury was due was one of which he had no knowledge and where there is no positive evidence tending to charge him with actual or constructive knowledge of such peril. This principle applies whether the risks in question existed at the time the miner commenced the performance of his contract or were afterwards created by some material change in the intrinsic conditions or relative arrangement of the instrumentalities by which the work was being done, or the substances which the injured miner was required to handle.

Batesel v. American Zinc, Lead & Smelting Co., —— Mo. ——, 207 Southwestern 742, p. 744.

DANGERS KNOWN TO OPERATORS.

Where a miner who was an entire stranger to the operator's mine was taken to a particular stope and put to work as a miner the mine operator owed him the duty of acquainting him with any dangerous condition that would surround him of which the operator had knowledge and that would not be apparent to the miner while acting in obedience to the operator's orders.

Miller v. Utah Consol. Min. Co., —— Utah ——, 178 Pacific 771, p. 774.

OBVIOUS DANGERS.

There is no duty resting upon a mine operator to notify or instruct even an inexperienced miner as to dangers which are open and apparent to every person.

Batesel v. American Zinc, Lead & Smelting Co., —— Mo. ——, 207 Southwestern 742, p. 744.

FAILURE TO WARN—EXCUSE.

The only thing which excuses a mine operator from his duty to warn and instruct an inexperienced miner as to hazards and dangers not usually comprehended by the inexperienced is that at the time of his application for employment the miner held himself out to the operator as being capable of performing the work with its attendant dangers and as knowing and comprehending the same. But where hazardous work was imposed on an inexperienced miner by force of the circumstances under which he worked, or by direct commands from the employer, then the element of the miner holding himself out as being qualified is wholly lacking and the operator can not be relieved of the duty to warn and instruct the inexperienced miner.

Batesel v. American Zinc, Lead & Smelting Co., —— Mo. ——, 207 Southwestern 742, p. 744.

LIABILITY FOR FAILURE TO WARN—QUESTION OF FACT.

An inexperienced person applied to a mine operator for work as a shoveler and made no representations as to being experienced in exploding dynamite. The work in the mine as a shoveler does not include "popping" bowlders with dynamite and there is no presumption that a person applying for such a position would be experienced in the use of dynamite for breaking bowlders. Under such circumstances the question of a mine operator being put on notice as to the inexperience of the shoveler and of his negligence in not informing the shoveler of the dangers was a question of fact to be determined by a jury on the trial of the case.

Batesel v. American Zinc, Lead & Smelting Co., —— Mo. ——, 207 Southwestern 742, p. 745.

DUTY TO PROMULGATE RULES.

EMPLOYER'S KNOWLEDGE OF VIOLATION.

Where a mine operator knowingly suffered his rule to be habitually violated by his miners its observance must be treated as waived by the employer and he will not be permitted to set up a violation as contributory negligence in an action against him by an injured employee.

Red Feather Coal Co. v. Murchison, —— Ala. ——, 80 Southern 354, p. 355.

UNCERTAIN AND IMPRACTICAL—WAIVER.

Where a rule of a mine operator, the disobedience of which was charged as contributory negligence of the miner, was so impractical that it could not be carried into execution, then as to an employee it is to be treated as waived by the employer.

Red Feather Coal Co. v. Murchison, —— Ala. ——, 80 Southern 354, p. 355.

PROOF OF EXISTENCE OF RULE.

The proof of the existence of a mine operator's rule must be proved in a more direct way than by asking a witness if he had not been told what the rule was.

Sloss-Sheffield Steel & Iron Co. v. Bearden, —— Ala. ——, 80 Southern 42, p. 44.

RECISION OF RULE—DIRECTIONS TO DISOBEY.

A rule adopted by a mine operator that is not statutory may be waived or rescinded and it is a sufficient recision or waiver where the mine operator directed a miner to do some act contrary to or in violation of the rule.

Sloss-Sheffield Steel & Iron Co. v. Bearden, —— Ala. ——, 80 Southern 42, p. 44.

VIOLATION OF RULE—RECOVERY PREVENTED.

A servant who violates known rules adopted and promulgated by the employer to promote his safety and is injured in consequence of such violation can not make his own fault the ground of recovering damages for his employer, but must take the consequence of his disobedience.

Red Feather Coal Co. v. Murchison, —— Ala. ——, 80 Southern 354, p. 355.

VIOLATION BY MINOR—PARENT'S RIGHT TO RECOVER.

A minor, a convict, was being worked in a mine under some arrangement with the State. While so working he used a slope in the mine where empty and loaded cars were taken in and out of the mine that were operated rapidly over the tracks. A manway near by was provided for the use of the employees in going to and from their work in the mine, and a rule of the mine operator expressly prohibited the miners from using the slope in passing in and out of the mine and the minor convict was warned of the danger in passing in and out of the mine by way of the slope. While so violating the rule the minor convict was killed. Under these facts his father could not recover damages from the mine operator for the alleged wrongful death of his son.

Red Feather Coal Co. v. Murchison, —— Ala. ——, 80 Southern 354, p. 355.

VICE PRINCIPALS.

RELATION AND NEGLIGENCE.

A mine operator is liable for the negligence of his vice principal who ordered a workman into a position that he knew or ought to have known was dangerous without any warning and without taking any precautions whatever for his safety and where the vice principal himself increased the danger after he had been informed by the superintendent that the place was in fact dangerous.

Medley v. Parker-Russell Min., etc., Co., —— Mo. App. ——, 207 Southwestern 887, p. 889.

NEGLIGENCE OF SUPERINTENDENT—LIABILITY OF MASTER.

A mine operator is liable for the negligence of the person having superintendence of a heading and the muckers and drill helpers and other miners therein, where such person negligently orders or permits a mucker to work under a loose and dangerous rock and where while so working the mucker was injured by the fall of the rock.

Republic Iron & Steel Co. v. Harris, —— Ala. ——, 80 Southern 426, p. 428.

NEGLIGENCE AND GROSS NEGLIGENCE—INJURY TO EMPLOYEE—LIABILITY OF EMPLOYER.

Under what is known as the Kentucky rule an injured employee can not recover in an action for damages against the mine operator on the ground of the negligence of a superior who has immediate control or supervision of the employee unless the negligence of such superior was gross. The reason of the rule is that the employee undertakes not to hold the employer liable for the ordinary negligence of the employees with whom he is engaged, whose actions and conduct he can observe and guard against.

Tway Min. Co. v. Tyree, —— Ky. ——, 208 Southwestern 817, p. 820.

NEGLIGENCE OF PERSON HAVING SUPERINTENDENCE—QUESTION OF FACT.

An employee of a mine operator had superintendence of a particular heading, and the muckers, drill helpers, and other miners working in the heading had to obey him. In the course of mining operations the bank boss and the miner having superintendence in the heading inspected the place and discovered a rock that should have been taken down. In an action by a miner for injuries caused by the fall of the rock it was a question of fact for the jury to determine whether the undertaking by the miner having superintendence of the muckers to remove the rock was in pursuance of orders of his immediate superintendent, the bank boss, or whether it was of the concurrent judgment of both.

Republic Iron & Steel Co. v. Harris, —— Ala. ——, 80 Southern 426.

DUAL POSITION—EMPLOYEE SUPERINTENDING WORK.

An employee was placed in charge of a fire clay pile and of the men working to remove it with authority to direct the movements of the haulers both as to where to drive the wagons and when and where to load the clay into the wagons, and he was charged with the duty to exercise due care to discover indications of danger and to warn the men thereof. The superintendent of the mine was rarely at this particular portion of the premises and the supervision of the work was left to the employee. The employee in charge of the work did also some of the manual labor in picking and shovelling. The employee thus occupied a dual capacity being a vice principal of the master with respect to his authority over the haulers and shovellers and his duty to take precautions for their safety and an ordinary laborer with respect to the mere manual duties which he performed.

Medley v. Parker-Russell Min., etc., Co., —— Mo. App. ——, 207 Southwestern 887, p. 889.

FELLOW SERVANTS—RELATION—NEGLIGENCE.

LIABILITY OF OPERATOR FOR NEGLIGENCE OF FELLOW SERVANT.

The rule in Kentucky is that operators or drivers of separate cars in a coal mine are not fellow servants of other employees of the same master engaged in operating other cars, and if a servant or driver engaged in operating one car is injured by the negligence of a servant engaged in operating another car, the mine operator will be liable. The rule applies whether the cars are hauled by mules, propelled by steam or electricity, or pushed by hand.

Tway Min. Co. v. Tyree, —— Ky. ——, 208 Southwestern 817, p. 819.
See Harris v. Rex Coal Co., 177 Ky. 630, 197 Southwestern 1075.
Elkhorn Corp. v. Paradise, 180 Ky. 572, 203 Southwestern 291.
Forlow v. Athletic Min. & Smelting Co., —— Mo. App. ——, 209 Southwestern 117.

NEGLIGENCE—LIABILITY OF EMPLOYEE.

The Kentucky court of appeals is committed to the doctrine of the "association theory" or to the rule that a mine operator will not be excused for negligence resulting in injury to one employee inflicted by a fellow employee, unless the employees are so engaged and situated as that each by carefulness and attention in the performance of his duties may protect himself from injury caused by the negligence of the employee with whom he is working.

Tway Min. Co. v. Tyree, —— Ky. ——, 208 Southwestern 817, p. 819.

NEGLIGENCE—ORDINARY OR GROSS—LIABILITY.

An employee was injured by the negligence of another employee of the same employer, who was not directly associated with him or in any degree subject to his control or advice and against whose negligence he had no means of protecting himself. Under such circumstances the injured employee may recover of the employer damages for injuries caused by the negligence of such other employee, whether it was ordinary or gross and without any reference to the position and place the employee causing the injury held.

Tway Min. Co. v. Tyree, —— Ky. ——, 208 Southwestern 817, p. 820.

CONTRIBUTORY NEGLIGENCE OF MINER.

EXERCISE OF CARE IN USE OF APPLIANCE.

Where contributory negligence is charged arising from the use of an appliance the controlling question is not whether by the use of ordinary care the injured employee could have used the appliance so as to have avoided injury, but whether he exercised ordinary care in using it in the manner in which he did use it at the time of the injury.

Standard Oil Co. v. Allen, —— Ind. App. ——, 121 Northeastern 329, p. 337.

QUESTION OF FACT.

A motor helper was injured while standing on the footboard of the locomotive motor. The alleged negligence of the mine operator was in failing to furnish a suitable footboard, running the motor without a headlight, and in running it at too great a speed on a sharp curve. Whether under these circumstances the employee was guilty of contributory negligence was a question of fact to be determined by the jury.

Inspiration Consol. Copper Co. v. Lindley, —— Ariz. ——, 177 Pacific 24, p. 26.

MAXIM OF RES IPSA LOQUITUR—BURDEN OF PROOF.

The maxim of res ipsa loquitur applies where the means and instrumentalities employed by a master, a mine operator, are peculiarly within his knowledge and under his control. The reason of the rule is that the master is in a better condition to explain the cause of the accident than the injured party and the burden of proof is cast upon him to disprove the allegation of negligence.

Daugherty v. Neosho-Granby Min. Co., —— Mo. App. ——, 207 Southwestern 253, p. 254.

PROOF BY PLAINTIFF—PEREMPTORY INSTRUCTION.

In an action by a miner for damages for personal injuries occasioned by a fall of the roof in the miner's working place, the evidence tended to show that no negligence proximately contributed to the injury but the negligence of the plaintiff himself. Under such circumstances it was proper for the court to give a peremptory instruction to the jury requiring them to return a verdict for the defendant.

Stone v. Pratt Consol. Coal Co., —— Ala. ——, 80 Southern 882.

FREEDOM FROM—PRESUMPTION.

The presumption of freedom from contributory negligence always obtains in case of the death of a miner or an employee.

Carley v. Dexcar Coal Min. Co., —— Pa. ——, 105 Atlantic 651, p. 653.

INATTENTION—INDIFFERENCE—FORGETFULNESS.

On the trial of an action for damages for the death of a miner caused by his coming in contact with a live electric wire, the trial court instructed the jury as follows: "If the jury believe from the evidence that the plaintiff's intestate knew of the location of the wire which caused his death, and of the danger therefrom, and if the jury believe from the evidence that the death of the plaintiff's intestate was proximately due to his inattention, indifference, absentmindedness, or forgetfulness of the presence and danger of said wire, then their verdict must be for defendant." This charge was criticised on the ground that the deceased's forgetfulness of the presence and danger of the wire was not negligence unless a reasonably prudent man under the circumstances would have been likely to have been mindful of the peril from the wire. The Federal Court in passing upon the correctness of the instruction and upon the criticism said that it might be conceded that the criticism of the correctness of the instruction would merit consideration if the question were presented to that court without previously having been passed upon by the Supreme Court of Alabama. "One's conduct in Alabama must be treated in this court as amounting to contributory negligence if the settled law of that State requires that it be so treated."

Roberts v. Tennessee Coal, Iron, etc., Co., 255 Federal 469, p. 473.

INSTRUCTION DEFINING.

An instruction defining contributory negligence is not erroneous where the language used made it plain enough that the negligence of the deceased miner that would deprive his personal representative of a right of action must have been an effective cause of the injury in the same manner as the alleged fault of the employer must have been the cause of the injury for the latter to be liable, in the absence of contributory negligence on the part of the miner.

Roberts v. Tennessee Coal, Iron, etc., Co., 255 Federal 469, p. 473.

MINER OBEYING ORDER OF SUPERIOR.

A miner employed in hauling fire clay and whose duty required him to assist in loading the clay was directed by the mine foreman to work near an embankment in shoveling the loose clay into his wagon. The position assigned the hauler while so shoveling was known to the mine foreman to be dangerous and the foreman himself had increased the danger by picking under the embankment. While shoveling up the loose clay, the embankment fell and killed the shoveler. The deceased, in an action for damages for his death could not, as a matter of law, be charged with contributory negligence and the action defeated, but the question of his contributory negligence under the circumstances was one of fact to be determined by the jury.

Medley v. Parker-Russell Min., etc., Co., —— Mo. App. ——, 207 Southwestern 887, p. 889.

MINER OBEYING INSTRUCTION—DANGER IMMINENT AND GLARING.

On the trial of an action for damages for the death of a miner on the ground that the mine foreman negligently ordered and directed the miner to occupy a dangerous position while performing his work, an instruction by the court to the jury to the effect that if they believed that the deceased was at the time he received his injuries causing his death working at a place in obedience to instructions of the mine foreman he could not be charged with contributory negligence unless the danger was so imminent and glaring that no reasonably careful and prudent man would have obeyed the instructions and worked in the particular place.

Medley v. Parker-Russell Min., etc., Co., —— Mo. App. ——, 207 Southwestern 887, p. 890.

BREAKING BOWLDERS WITH DYNAMITE.

Whether or not an inexperienced person working as a shoveler in a mine was guilty of contributory negligence in undertaking to use dynamite in breaking bowlders in view of his knowing his own inexperience and the danger of so doing depends upon whether the danger was so obvious and glaring that a reasonably prudent man would not under the same circumstances undertake to do so.

Batesel v. American Zinc, Lead & Smelting Co., —— Mo. ——, 207 Southwestern 742, p. 745.

KNOWLEDGE OF DANGER—NECESSARY USE OF DANGEROUS WAY.

A miner can not be charged with contributory negligence because of his knowledge of the location of dangerous machinery along or near the place he was required to travel in going to and from his work, where no other place was provided and where he was required to use the particular way in traveling to and from his work.

Carley v. Dexcar Coal Min. Co., —— Pa. ——, 105 Atlantic 651, p. 653.

OBEYING DIRECTION OF FOREMAN—QUESTION OF FACT.

A miner was directed by the mine foreman to pass through a dark tunnel in the mine. While passing through the tunnel he was struck and injured by loaded cars passing through the tunnel without lights or signals. The question of the miner's contributory negligence under such circumstances was one of fact for the jury to determine in his action for damages.

Ford v. Philadelphia & Reading Coal & Iron Co., —— Pa. ——, 105 Atlantic 885, p. 886.

VIOLATION OF RULE—UNCERTAINTY AND WAIVER.

A miner can not be charged with contributory negligence in the violation of a rule where either the rule was so impractical that it could not be carried into execution, or where the employer knowingly suffered the rule to be habitually violated by the employees.

Red Feather Coal Co. v. Murchison, —— Ala. ——, 80 Southern 354, p. 355.

VIOLATION OF RULE—PROXIMATE CAUSE.

A rule of a mining company prohibited employees from riding on tram cars. A miner was sent to load certain pipes on a tram train and after putting the pipe on the train attempted to board one of the cars and the operator of the dinkey engine attached to the cars suddenly accelerated the speed of the cars and in consequence of the sudden movement the miner's foot passed under the wheels and was mashed. Under the circumstances the particular negligence that proximately caused the injury was the sudden movement of the engine and tram train by the operator of the engine. The violation of a rule of the operator forbidding the miners to ride on the trams would not have been negligence on the plaintiff's part proximately contributing to his injury nor so related to the event as to preclude a recovery for the injury proximately caused by the act of the defendant's operative in suddenly accelerating the movement of the cars.

Sloss-Sheffield Steel & Iron Co. v. Bearden, —— Ala. ——, 80 Southern 42.

ATTEMPTING TO BOARD MOVING TRAM.

A miner attempting to board a slowly moving tram train was not to be charged with contributory negligence and his action for damages defeated because he was attempting, when injured, to board the moving train, where the engineer of the dinkey engine drawing the tram train saw the miner as he was in the act of getting on the moving car and suddenly accelerated the speed of the cars, whereupon in consequence of the sudden movement of the car the miner's foot passed under the wheel and was mashed.

Sloss-Sheffield Steel & Iron Co. v. Bearden, —— Ala. ——, 80 Southern 42, p. 43

CARE REQUIRED—NEGLIGENCE OF COEMPLOYEE.

A mule driver in a mine was required to pass under an air curtain, but the driver had received no particular instructions as to the method of passing the curtain in order to avoid collision with mules and cars coming from the opposite direction. A driver is not to be charged with contributory negligence and his action for damages for injuries by a collision defeated because he did not stop or get off his car and lift the curtain to see if mules or cars were coming from the opposite direction where the collision was caused by a loose mule being chased down the same track by another driver.

Tway Min. Co. v. Tyree, —— Ky. ——, 208 Southwestern 817, p. 818.

WANT OF KNOWLEDGE OF DANGER—QUESTION OF FACT.

A miner was employed as a pusher in a lignite coal mine and his duties consisted in pushing out cars of lignite coal and in attaching the loaded cars to a cable preparatory to being hauled up an incline to the unloading place. He was instructed to watch the loaded cars as they were drawn up and if a car ran off the track to ring a bell in order to stop the team hauling the car. On one occasion as a loaded car started up the incline the pusher stooped down in order to see if the car ran off the track and while in that position the cable attached to the car broke and the car started down the incline and caught and injured him. Under these facts he could not as a matter of law be charged with contributory negligence where he had no knowledge of the worn and defective condition of the cable and had no knowledge of the presence of a manhole at the side of the track from which he should have watched the operation of the car.

Abelstad v. Johnson, —— N. Dak. ——, 170 Northwestern 619, p. 620.

MINER'S WORKING PLACE—ASSUMPTION OF SAFETY.

A miner is not guilty of contributory negligence for working in a place where he had a right to assume in the absence of patent and obvious defects that the place was reasonably safe.

Henness v. Pend D'Oreille Min. & Reduction Co., —— Idaho ——, 178 Pacific 836.

ASSUMPTION OF RISK.

RISKS ASSUMED.

RISKS INCIDENT TO EMPLOYMENT.

An employee assumes the ordinary risks incident to his employment.

Inspiration Consol. Copper Co. v. Lindley, —— Ariz. ——, 177 Pacific 24, p. 25.

The doctrine that an employee assumes the ordinary risks and dangers of his employment that are known to him or which by the exercise of ordinary diligence he should have known is one of universal application.

Miller v. Utah Consol. Min. Co., —— Utah ——, 178 Pacific 771, p. 774.

KNOWLEDGE OF DEFECTS.

Where an employee in a mine knows of defects in a machine or other instrument furnished him with which to work and continues to use it as a general rule he assumes the risk and the mine operator is not liable for injuries thus incurred.

Long v. Pocahontas Consol. Collieries Co., —— W. Va. ——, 98 Southeastern 289, p. 292.

OPEN AND OBVIOUS DANGERS.

An employee assumes the risk of injury from the extraordinary and unusual dangers and hazards of his work if they were open and obvious to and were fully observed and understood and appreciated by him.

Inspiration Consol. Copper Co. v. Lindley, —— Ariz. ——, 177 Pacific 24, p. 25.

RISKS NOT ASSUMED.

QUESTION OF FACT.

A motor helper was injured while standing on the footboard of the locomotive motor. The alleged negligence of the mine operator was in failing to furnish a suitable footboard, running the motor without a headlight, and in running it at too great a speed on a sharp curve. Whether under such circumstances the employee assumed the risk was a question of fact to be determined by the jury.

Inspiration Consol. Copper Co. v. Lindley, —— Ariz. ——, 177 Pacific 24, p. 26.

DANGERS UNKNOWN TO MINER.

A miner does not assume risks which are unknown to him or dangers which by reason of his inexperience he does not comprehend. A mine operator is prima facie bound to instruct an inexperienced miner as to all risks which are abnormal or extraordinary and at the same time of such a kind that the servant can not be held chargeable with an adequate comprehension of their nature and extent or of the proper means by which to safeguard himself.

Batesel v. American Zinc, Lead & Smelting Co., —— Mo. ——, 207 Southwestern 742, p. 744.

EMPLOYEE'S IGNORANCE OF DANGER—HAZARDS OF SERVICE.

An employee does not assume the risks from the dangers of the employment of which he was ignorant and as to which he had been given no reasonable instruction, although they are the ordinary hazards of the service, unless they are so obvious that even an inexperienced man would observe them by the exercise of ordinary care.

Silurian Oil Co. v. Morrell, —— Okla. ——, 176 Pacific 964, p. 967.

RISKS OF EMPLOYMENT—QUESTION OF FACT.

Under certain circumstances and conditions the question as to whether a risk was incident to the employment may be one of fact for the jury in an action by a miner for damages for injuries.

Miller v. Utah Consol. Min. Co., —— Utah ——, 178 Pacific 771, p. 774.

NEGLIGENCE OF MASTER.

Negligence of an employer is never a risk assumed by an employee.

Miller v. Utah Consol. Min. Co., —— Utah ——, 178 Pacific 771, p. 774.

NEGLIGENCE OF OPERATOR—DANGER IMMINENT.

An employee does not assume the risk of the negligence of the employer, unless the danger thereof was so imminent that a man of ordinary prudence would not have incurred the risk or hazard.

Inspiration Consol. Copper Co. v. Lindley, —— Ariz. ——, 177 Pacific 24, p. 25.

WORKING UNDER ORDERS—DANGERS.

An employee does not assume the extraordinary risk of the negligence of the employer, or while in obedience to the employer's order he works in a dangerous place with unsafe appliances, or in a dangerous manner, unless such danger was so imminent that a man of ordinary prudence would not have incurred the risk or hazard.

Inspiration Consol. Copper Co. v. Lindley, —— Ariz. ——, 177 Pacific 24, p. 25.

SHOVELER BREAKING BOULDERS WITH DYNAMITE—PROOF OF CUSTOM.

A shoveler in a mine was injured while attempting to break up a large boulder with dynamite. In an action against the mine operator for damages it was error for the court to admit evidence showing that in mining operations, as generally carried on in the particular district the work of "popping" boulders with dynamite was not entrusted to common laborers such as shovelers but to men specially chosen and skilled in such work. Such evidence shows that such work required special knowledge and skill to minimize the danger and that the injured shoveler in applying for and accepting the job of shoveler was not contracting to break boulders with dynamite or holding himself out as competent to do such work.

Batesel v. American Zinc, Lead & Smelting Co., —— Mo. ——, 207 Southwestern 742, p. 743.

DANGERS FROM DEFECTIVE APPLIANCES.

A pusher was employed to push loaded cars to the foot of an incline and there attach a cable by which the cars were drawn up the incline. While stooping down to see if a car did or would run off the track, the cable broke and the car ran down the incline and injured him. Under such conditions it can not be said as a matter of law that the pusher assumed the risk of the danger where the breaking of the cable was due to its worn and defective condition of which he had no knowledge.

Abelstad v. Johnson, —— N. Dak. ——, 170 Northwestern 619, p. 620.

PROXIMATE CAUSE OF INJURY.

WHAT CONSTITUTES PROXIMATE CAUSE.

To constitute a proximate cause of an injury it is not necessary that the act or omission complained of as negligent should be the direct or immediate cause, but there must be a causal connection between the two, a continuous flow of consequences which culminated in the injury so that it can be said that the negligence alleged entered into and became an actual agency or efficient cause.

Haney v. Texas & Pacific Coal Co., —— Tex. Civ. App. ——, 207 Southwestern 375, p. 381.

NEGLIGENCE OF OPERATOR—BURDEN OF PROOF.

In an action for the death of a miner caused by the alleged negligence of the mine operator, the burden of proof rested on the complainant to show by an unbroken sequence of cause and effect, that the negligence charged was the proximate cause of the death of the miner.

Connors-Weyman Steel Co. v. Kilgore, —— Ala. ——, 80 Southern 454, p. 455.

PROXIMATE CAUSE—INTERVENING AGENCY.

A wrongful act or omission relied upon as constituting the proximate cause of an injury must be such as that therefrom the injury or some similar injury might be reasonably contemplated. The negligence must be the cause of the injury; but if the causal connection is broken by the intervention of a wholly independent act of another which of itself causes the injury, then the original act of negligence becomes the remote and not the proximate cause of the injury.

Haney v. Texas & Pacific Coal Co., —— Tex. Civ. App. ——, 207 Southwestern 375, p. 381.

CONTRACTS RELATING TO OPERATIONS.

CONTRACT TO DRILL OIL WELL—CONSTRUCTION.

A contract by which the second party agreed to drill an oil well stipulated that the well should be drilled into the oil sand or to a depth of 3,500 feet, if required by the contractor. The "oil sand" contemplated by the contract was producing oil sand, or sand producing oil in reasonably paying quantities, and in default of drilling into such producing oil sand the contractor was justified in requiring the well to be drilled to a depth of 3,500 feet unless the phrase "into the oil sand" has some special local meaning with reference to which the parties contracted.

California Well Drilling Co. v. California Midway Oil Co., —— Cal. ——, 177 Pacific 849, p. 852.

CONDITIONAL SALE OF CASING FOR OIL WELLS.

Casing for use in drilling an oil and gas well was delivered to the driller under a contract by which a specific rental was to be paid, but if the well produced oil or gas in paying quantities, or if the casing was used in any other well, then the same should be paid for at the stipulated price in addition to the rental, otherwise the casing was to be returned to the seller. This agreement constituted a bailment and not a sale of the casing and the title did not pass and the seller could not maintain an action to recover the price of the casing.

U. S. Supply Co. v. Andrews, —— Okla. ——, 176 Pacific 967, p. 968.

MINER'S CONTRACT FOR SERVICES—PAYMENT OUT OF PROCEEDS OF MINE.

A mining company employed a miner to work for it in its mine under a contract entered into in the State of Idaho. The contract of employment expressly provided that the miner was to receive compensation in a specified manner and partially payable out of the proceeds of the company's mine in which he worked. The miner brought suit in a court in Washington to recover the value of his services on the ground that the statute of Washington (Remington Code, 1915, sections 6560–61) makes such contracts entered into in the State of Washington unlawful. The defendant mining company was a Washington corporation but carried on all of its mining operations wholly within the State of Idaho and the miner also was a resident of the State of Washington. The mining company performed its part of the agreement and paid the miner according to the terms of the contract. The contract as made involved no inherent element of immorality or coercion and it would be illegal if made to be performed in Washington only because of the statute, but aside from the statute it was not in contravention of public policy. The parties both voluntarily went into the State of Idaho and made the contract there and thereby voluntarily submitted themselves to the laws of Idaho in so far as their rights under it were concerned. In seeking to enforce the contract in Washington either affirmatively or as a defense, the parties should be treated and their rights measured by the courts of Washington as if they were residents of Idaho. When a resident of one State voluntarily goes into another State and there makes a contract to be wholly performed there, which is valid and binding under the laws of that State, and it is sought to be enforced by the other party thereto in the courts of another State as the basis of a cause of action, he should not have any higher or better right to invoke the public policy of the State of his residence in avoidance of the contract than he would have if he were a nonresident of the State. Under these circumstances a miner is not in a position to claim any special rights or privileges looking to the avoidance of the contract merely because he was a resident of the State of Washington and he can not rightfully claim to be injured thereby as a resident of the State. The statute of Washington can not make a contract executed and to be performed in another State unenforceable in the courts of Washington.

Hatcher v. Idaho Gold & Ruby Co., —— Wash. ——, 179 Pacific 106, p. 107.

INDEPENDENT CONTRACTOR.

RELATION—QUESTION OF FACT.

Under a proper issue and the proof to sustain it, the question of whether the person under whom an injured miner was working was an independent contractor or a lessee of the mine was a question of fact to be determined by the jury.

Connors-Weyman Steel Co. v. Kilgore, —— Ala. ——, 80 Southern 454.

INJURY TO EMPLOYEE—LIABILITY OF OPERATOR.

Where an employer reserves the right to direct the manner in which the work shall be performed in any particular, or where he undertakes to provide any of the instrumentalities used in the process of the work he owes to the employees of an independent contractor the duty of ordinary care in directing such matters over which he retained control or undertook to perform.

Slick Oil Co. v. Coffey, —— Okla. ——, 177 Pacific 915, p. 917.

METHODS OF OPERATING.

GRANT TO TRANSPORT COAL UNDER THE SURFACE—CONSTRUCTION.

A deed for coal gave the grantee the right to mine and remove the coal under the land conveyed and also gave the grantee the right to remove and carry away "under said described premises" other coal belonging to the grantee. Under this deed the grantee could open drifts and haulageways to the surface and lay on the surface of the land its tracks for the transportation of the coal mined under the surface of the tract conveyed, but the surface owner had the right to enjoin and restrain the grantee from hauling and transporting over such tracks on the surface of his land coal mined from other lands owned by the grantee. The grant restricted the grantee's right to transport coal mined by the grantee from other lands "under said described premises." This did not give the grantee any right to convey or transport over or upon the surface of the grantor's land any coal mined and taken from lands other than described in the grant.

Shaulis v. Quemahoning Creek Coal Co., —— Pa. ——, 105 Atlantic 826, p. 827.
See Potter v. Wren, 201 Pa. 318, 50 Atlantic 821.

ENTRIES UNDER STREET—RIGHT OF LANDOWNER TO ENJOIN.

A mining corporation obtained consent of the township authorities to construct entries under the surface of a road and in front of the lands of an abutting owner, but the nearest point the entry approached was within six feet of the complainant's land. No mining operations had been conducted by the company under the road and no coal under the road within the lines of the complainant's land had been removed nor was it the intention of the coal company to remove any. Under these facts the landowner was not entitled to a preliminary injunction, because of his failure to show irreparable injury.

Nugent v. Bowerton Min. Co., —— Pa. ——, 106 Atlantic 112.

SURFACE AND SUBTERRANEAN EXCAVATIONS.

Where the term "mines and minerals" is used in grants or in reservations in instruments of conveyance or in statutes the word "mines" is not limited to mere subterranean excavations or workings, nor is the word "minerals" limited to metals or metalliferous deposits whether contained in veins having well-defined walls or in beds or deposits that are irregular or are found at or near the surface.

Byron v. Utah Copper Co., —— Utah ——, 178 Pacific 53, p. 56.

UNCHOKING BLAST HOLE WITH STEEL DRILL.

A miner with others was attempting to unchoke a blast hole. After the unsuccessful use of a pole and under the direction of the superintendent they used a diamond drill and while so engaged the powder exploded, filling the eyes of the suing miner with smoke and dust and dirt, and in running from the place of danger he ran over a high bank and was injured by the fall. On the trial of the case for damages it was proper to permit experienced witnesses to testify that it was the custom among well-regulated ore mines to unchoke blast holes with a drill and it was proper for a witness to state that in many years of experience in employment for the defendant he had never known the powder to explode.

Sloss-Sheffield Steel & Iron Co. v. Thomas, —— Ala. ——, 80 Southern 69, p. 71.

RIGHT TO SURFACE SUPPORT.

MINERALS "IN OR UNDER THE SURFACE"—MINING AND REMOVING.

A deed conveying the surface but reserving to the grantor the right to all ores "in and under the surface," with the right to mine and remove the same, reserves to the grantor all the valuable mineral whether in or under the surface and gives him the right to mine and remove the same without leaving support for the surface or without in fact leaving any surface where surface mining was the method of operating at the time of the conveyance and where the parties by the conveyance contemplated such method of mining.

Byron v. Utah Copper Co., —— Utah ——, 178 Pacific 53, p. 56.

WAIVER OF RIGHT.

A lease of coal rights gave to the lessee the exclusive privilege of mining and carrying away coal with as full right as if the lessee were the actual owner of the land, the same to be exercised without any liability for damages resulting from the use and exercise of such right. This grant indicates in the clearest terms the intention of the lessor that the lessee should not be liable for damages for failure to support the surface.

Weakland v. Cymbria Coal Co., —— Pa. ——, 105 Atlantic 558, p. 559.

NUISANCE.

SMELTER OPERATIONS—INJURY FROM POISONOUS GASES—PROOF.

A complaint in an action for damages alleged that crops, fruits, vines, berries, and vegetables of the plaintiff were damaged and destroyed from smoke and fumes blown over the lands from a nearby smelter and that such smoke and fumes contained sulphur, arsenic, lead, and zinc in various combinations and of sufficient quantities to destroy the vegetation and poison animals. It was sufficient for the plaintiff to sustain the burden of proof when he showed at the time his plants and vegetation were destroyed and damaged the defendant's smelter was freely emitting fumes, gases, and acids that were destructive of plant and animal life, and that the wind did blow such fumes and poisonous gases toward his premises near which the smelter was located and that there was no other known agent of destruction existing in the vicinity.

Courtney v. American Zinc, Lead & Smelting Co., —— Kans. ——, 179 Pacific 342.
See Wichers v. New Orleans Acid & Fertilizer Co., 128 La. 1011, 55 Southern 657.

SMELTER OPERATIONS—PROOF OF DAMAGES—COMPETENCY OF TESTIMONY.

In an action against a smelting company for damages for injuries to animals and vegetation, it was proper for experts to give an opinion that stock in the vicinity of the smelter had been made sick from smoke and fumes from the smelter, without proof that the smoke and fumes contained poisonous and deleterious substances. It was not necessary to prove the precise nature of the gases and fumes that came from the stacks of the smelter. Proof that at some seasons of the year when the winds prevailed in one direction the crops on lands opposite thereto and in the vicinity of the smelter were affected or destroyed by the fumes and that these fumes had an effect on the health of animals and live stock. It was also competent to prove the condition of other premises and the experience of other farmers located at varying distances and in different directions from the smelter in order to establish the fact that whatever the fumes consisted of they were poisonous and deleterious to the lives of animals and live stock.

Courtney v. American Zinc, Lead & Smelting Co., —— Kans. ——, 179 Pacific 342, p. 343.

OIL TANKS—ESCAPE OF OIL—INJURY TO LAND.

The Standard Oil Company maintained a large number of oil tanks surrounded by tank dikes several feet high, built for the purpose of conserving oil in case the tanks should catch on fire and the oil run out of the tanks. The company maintained an open drainpipe in the bottom of the dikes and any oil accumulating in the dike would pass through this drainpipe onto the adjoining lands. Crude oil was permitted to accumulate in the dike and run through the drainpipe onto the lands of the complainant to his damage. It was the duty of the oil company as owner of the tanks and dikes to exercise ordinary care to prevent any oil from escaping and flowing onto the adjacent premises. The question of the negligence of the oil company in so maintaining its tanks, dikes and the drainpipe and its effort to close the drainpipe were questions of fact to be determined by the jury.

Standard Oil Co. v. Glenn, —— Okla. ——, 176 Pacific 900.

INJUNCTION.

CONTRACT FOR SALE OF COAL—INJUNCTION TO PREVENT BREACH.

A coal-mine operator entered into a contract with an agent by which the agent was to handle and sell the entire output of the lump coal from the mine from March 1, 1917, to March 1, 1918. The contract provided for the loading and shipping of coal and the sale and accounting, less a stated commission. The agent fulfilled his part of his contract from its date to October 25, 1917, when the coal-mine operator notified him that the contract was not binding and refused to make further shipments on the order of the agent. The agent thereupon demanded the entire output of the mine and notified the operator of numerous contracts that he had made on the faith of the terms of his employment, some with the special approval of the mine operator, and that he was unable to fill these unless the coal was shipped pursuant to the contract. The rule that no ground for equitable relief was shown does not obtain in the State of Missouri, as the statute of that State broadens the grounds for the intervention of equity and justifies equitable relief "to prevent the doing of any legal wrong whatever, whenever in the opinion of the court an adequate remedy can not be enforced by an action for damages." An adequate remedy by an action for damages could not be afforded in this case, as no coal of like quality could be had and supplied to fill the agent's contracts, and he would be subject to a large number of suits for damages for his inability to comply with his contracts, due to the breach of the contract on the part of the mine operator.

Warren v. Ray County Coal Co., —— Mo. App. ——, 207 Southwestern 883, p. 886.

WRONGFUL DEATH.

DEATH OF MINOR CONVICT—RIGHT OF PARENT TO RECOVER.

A minor, as a convict, by some arrangement with the State, was being forced by a mine operator or his agents or servants, acting within the line and scope of their authority as such, to labor in a coal mine for the mine operator against his will, and while so working he was, through the alleged negligence of the mine operator, run over by a tram car and killed. Under such facts the father of the deceased minor and convict had the right to maintain an action against the negligent mine operator for damages for the death of his minor son.

Red Feather Coal Co. v. Murchison, —— Ala. ——, 80 Southern 354, p. 355.

NEGLIGENCE—PROOF INSUFFICIENT.

Proof that an employee was overcome by fumes of gasoline from a tank car and while in this condition fell from the car to a ditch at the side of the track and inhaled water, mud, and gasoline, and other waste products, and there died from suffocation, was insufficient to establish negligence. There was no substantial evidence, direct or express, fairly tending to prove the actual cause of the death, and the evidence was insufficient to justify a recovery on the ground of negligence in assigning the employee to a dangerous place to work.

Cash v. Kansas Oil Refining Co., —— Kans. ——, 176 Pacific 980.

POLLUTION OF STREAMS.

INJURY TO FISH—QUESTIONS OUTSIDE OF ISSUES.

In an action by a riparian owner against a mine operator for damages for the pollution of a stream and for injuries to the complainant's land by mining and smelting operations, the question of the existence or nonexistence of fish in the stream at any given time was outside of the issues and properly excluded.

Jones v. Tennessee Coal, Iron & R. Co., —— Ala. ——, 80 Southern 463, p. 464.

RIGHTS OF RIPARIAN PROPRIETOR—USE OF WATER.

A riparian owner has the right to use a stream and the water that flows through his land for ordinary purposes and the gratification of the natural needs even though the stream be consumed in such use, and this right has to be exercised both by himself and all living things in his legitimate employment.

Jones v. Tennessee Coal, Iron & R. Co., —— Ala. ——, 80 Southern 463, p. 464.

USE OF WATER—ABATEMENT OF FORMER RULE.

Public concern about the reasonable exigencies of agricultural and manufacturing enterprise must be allowed to abate somewhat of the right of riparian proprietors to have a stream flow as it has been accustomed to flow, to receive and discharge it without appreciable impairment of its original volume or purity.

Jones v. Tennessee Coal, Iron & R. Co., —— Ala. ——, 80 Southern 463, p. 464.
See Sloss-Sheffield Steel & Iron Co. v. Morgan, 181 Ala. 587, 61 Southern 283.

EXTRAORDINARY USE OF WATER—RESTORING WATER TO STREAM.

A riparian proprietor has the right to the extraordinary or artificial use of a stream and its waters, if by the use of the water it is not forced back or unreasonably or improperly precipitated on the lands of adjacent proprietors and after its use it is restored to its natural channel without unreasonable or material diminution before it leaves the land of the person so diverting or subjecting it to such artificial uses, and provided also it is not so polluted as to unreasonably or materially affect its ordinary and extraordinary use by the proprietor of the land into which the unused waters flow by its accustomed channel.

Jones v. Tennessee Coal, Iron & R. Co., —— Ala. ——, 80 Southern 463, p. 464.
See Stout's Mt. Coal & Coke Co. v. Ballard, 195 Ala. 283, 80 Southern 172.
Parsons v. Tennessee Coal, Iron & R. Co., 186 Ala. 84, 64 Southern 591.

USE OF WATER FOR MANUFACTURING PURPOSES—DIMINUTION.

Reasonable diminution of the quantity of water in a stream in gratifying and meeting customary wants has always been permitted, and the temporary detention of the waters of streams for manufacturing purposes followed by its release in increased volume is a necessary consequence of its utilization as a propelling force, and it is conceded that these uses necessarily detract somewhat from the normal purity of the waters so used. These modifications of individual right must be submitted to in order that the greater good of the public be conserved and promoted. Notwithstanding these changes the water course must not be diverted from its channel or so diminished in quantity or so corrupted and polluted as practically to destroy or greatly impair its value to the lower riparian proprietor. But no rule can be declared so clear and precise that it can be applied with certainty to every case that may arise.

Jones v. Tennessee Coal, Iron & R. Co., —— Ala. ——, 80 Southern 463, p. 464.
See Alabama Consolidated Coal & Iron Co. v. Turner, 145 Ala. 639, 39 Southern 603.
Sloss-Sheffield Steel & Iron Co. v. Morgan, 181 Ala. 587, 61 Southern 283.
Parsons v. Tennessee Coal, Iron & R. Co., 186 Ala. 84, 64 Southern 591.

CONTRIBUTING CAUSES—INDIVIDUAL LIABILITY.

A mining company maintaining an ore-washery plant can not be held liable to a lower riparian proprietor for damages for the pollution of the waters of a stream caused by other mining and ore-washing companies and other independently contributing causes that precipitated detrius or polluting elements into the stream above the complainant's lands and particularly where many of the contributing causes intervened between the complainant's land and the location of the defendant's washery.

Jones v. Tennessee Coal, Iron & R. Co., —— Ala. ——, 80 Southern 463, p. 464.
See Tennessee Coal, Iron & R. Co. v. Hamilton, 100 Ala. 252, 14 Southern 167.
Tutwiler Coal & Iron Co. v. Nichols, 146 Ala. 364, 39 Southern 762.

MINING LEASES.

LEASES GENERALLY—CONSTRUCTION.

CONSTRUCTION—MINERALS IN AND UNDER THE SURFACE—MEANING.

A mineral lease granted all the ores and minerals "in and underneath the surface." At the time of the execution of the lease it was known that the leased premises contained valuable ores and metals, and that at and before that time mining operations in the locality were carried on by mining at the surface as well as by underground operations, and that surface mining was the usual method employed by the lessee on property in close proximity to the leased premises. Under the lease as construed in the light of the situation of the parties and the existing conditions, the lessee had the right to mine and remove all minerals in and under the surface as well as dumps containing valuable ores and metals that had been piled upon the leased premises from excavations made thereon.

Byron v. Utah Copper Co., —— Utah ——, 178 Pacific 53, p. 56.

FAILURE TO PERFORM COVENANTS—NOTICE TO SURRENDER.

A mining lease provided that in the event the lessee failed to work the mine in a workmanlike manner and to properly timber the same so as to protect ores not removed, or failed to comply with any of the covenants or conditions of the lease, to the prejudice of the lessor, the lessor might forfeit the lease after thirty days' written notice and demand requiring performance by the lessee. A notice by the lessor to the lessee under this lease either to perform the covenants or to relinquish possession must point out specifically the default claimed so that the lessee could correct the same within the time limited. When a lease provides for a notice requiring the tenant in the alternative to perform the covenant or relinquish possession the notice must recite the breach or stipulation relied on with sufficient particularity to enable the lessee to correct his default.

Tri-Bullion Smelting & Dev. Co. v. Ozark Smelting & Min. Co., —— N. Mex. ——, 176 Pacific 817, p. 818.

TERMINATION BY NOTICE—SUFFICIENCY OF NOTICE.

Where a mining lease provides for its termination upon the failure of the lessee to comply with any of its terms and conditions after thirty days' notice of default and demand for compliance, a complaint by a lessor filed in a suit for possession of the premises setting up default in the terms and conditions of the lease will not take the place of the notice provided for by the terms of the lease and under which the lessee was to have thirty days' time within which to comply with its terms.

Tri-Bullion Smelting & Dev. Co. v. Ozark Smelting & Min. Co., —— N. Mex. ——, 176 Pacific 817, p. 818.

LEASES TO HIGHEST BIDDER.

The statute of Nebraska (Acts, Extra Session, 1918, section 16) provides that the holders of mineral leases that have been declared invalid may apply for new leases, and the Board of Educational Lands and Funds may in its discretion determine if the bonus and royalties are equal or better than the bona fide competitive bids and if the lessee has made extensive or expensive preparations and is prepared to proceed with development, the board may consider the same and issue a new lease. But the board under this section should call for competitive bids, and the holders of such invalid leases may bid with others and specify the bonus and royalty provided for in their former contracts, and if such lessees have paid money under leases declared void the payment will be taken into consideration and allowed as payment upon their new leases if they are successful bidders, otherwise the money paid on former void leases should be returned. The board may include more than one tract of land in a proposed lease of mineral rights if, in its discretion, the State would realize larger returns by so doing, but under the statute all leases must be made to the highest bidder in open competition and upon due notice.

Briggs v. Neville, —— Nebr. ——, 170 Northwestern 188, p. 189.

MINERAL LEASE OF AGRICULTURAL LANDS—ISSUANCE NOT ENJOINED.

The statute of Nebraska (Acts, Extra Session, 1918, section 16) authorizes mineral leases of State lands already leased for agricultural purposes. An agricultural lessee cannot enjoin the State Board of Educational Lands and Funds from issuing a mineral lease on lands held by him under an agricultural lease on the ground that the statute provides no method for determining or assessing his damages, although the act expressly provides that the mineral lessee shall pay all damages to growing crops caused by his operations.

Briggs v. Neville, —— Nebr. ——; 170 Northwestern 188, p. 190.

AGRICULTURAL AND MINERAL LESSEES—RELATIVE RIGHTS—DAMAGES.

Section 8 of the statute of Nebraska (Acts, Extra Session, 1918, section 16) provides that lessees of mineral rights shall pay all damages to growing crops caused by his operations and for the use of the land necessarily occupied. But the act contains no provision for ascertaining the amount of damages, and the lessee of the mineral rights is not authorized by his lease to interfere in any respect with the rights of the agricultural lessee without providing for the satisfaction of such damages; and if he is willing to accept the lease upon such conditions the rights of the agricultural lessee are not injured by this statute. The mineral rights lessee would rely upon being able to make a reasonable adjustment with the former agricultural lessee and he could not be wholly and arbitrarily deprived of his right to extract the minerals by unreasonable demands of the agricultural lessee. But if there is no other method provided for adjusting such claims or damages, a court of equity might provide a method.

Briggs v. Neville, —— Nebr. ——, 170 Northwestern 188, p. 190.

LEASE TO MINE IRON ORE—MISTAKE AS TO EXISTENCE OF ORE—RIGHT OF PARTIES.

The owner of lands containing iron ore entered into a contract and lease to extend for a period of forty years by which the lessee was to conduct mining operations and to mine at least 20,000 tons of ore each year and to pay a royalty of 50 cents per ton to the lessor. At the time of the execution of the lease both lessor and lessee believed that the lands contained merchantable iron ore in sufficient quantity to last for the full lease period on the basis of the required annual amount to be mined. After conducting mining operations for about 18 years the lessee gave notice of his intention to cancel and surrender the lease because iron ore could no longer be found on the leased premises either of the quality or quantity that could be profitably mined. It is manifest that the parties contracted entirely with reference to iron ore supposed to exist and that did exist on the land. The obligation proceeded upon the presumption that the ore was there and continued to be there in sufficient quantities to enable the lessee to perform his contract; but if the ore was not there so that it could no longer be taken out in the quantities specified, the lessee was entitled to be relieved of the lease. He could not do an impossible thing and therefore could not be held liable for not doing it. Such a lease imposes no obligation to pay the minimum royalty after the ore in the premises has become exhausted.

Virginia Iron, Coal & Coke Co. v. Graham, —— Va. ——, 98 Southeastern 659, p. 663.

See Boyer v. Fulmer, 176 Pa. 282, 35 Atlantic 235.
Ridgley v. Conewago Iron Co., 53 Federal 988.

PAYMENT OF ROYALTIES—MINIMUM BASIS—EXHAUSTION OF ORE.

A lease for mining iron ore was to continue for forty years and the lessor was to receive 50 cents per ton as compensation for each ton of good merchantable iron ore mined and shipped. The lease provided that no less than 20,000 tons were to be shipped each year and that was made the minimum basis of royalty; but any deficit in quantity in one year was to be equalized by a surplus in another year. The contingency provided against was the failure to mine and not the exhaustion of the ore assumed by both parties to exist. It is manifest that if the ore did not in fact exist, the lessee should be relieved from the obligation to pay the royalty provided for in the lease because the paramount consideration has failed and performance by the lessee has become impossible.

Virginia Iron, Coal & Coke Co. v. Graham, —— Va. ——, 98 Southeastern 659, p. 664.

PURCHASE OF LESSOR'S INTEREST BY LESSEE—MERGER.

The lessee of certain mining claims purchased during the existence of the lease, the lessor's interest. Ordinarily a purchase of the lessor's interest by a lessee merges the two estates; but the rule does not obtain where the contract of purchase expressly recited that the purchase should in no wise affect the existing lease and agreement and the lessee after the purchase was bound to pay the stipulated royalties for the full term of the lease.

Rayburne v. Stewart-Calvert Co., —— Wash. ——, 178 Pacific 454, p. 455.

PURCHASE OF HALF INTEREST—LIABILITY AS PARTNER.

An agreement by which one party was to sell and another to purchase a half interest in a mining lease on certain conditions and to become effective in the future after the mine was dewatered and ready for inspection and should in fact be inspected by the purchaser, does not create a partnership and make the purchaser liable as a partner for debts incurred by the seller in pumping the water from the mine and preparing it for inspection by the purchaser.

Mackie-Clemens Coal Co. v. Brady, —— Mo. App. ——, 208 Southwestern 151, p. 152.

SALE—CONSIDERATION—PAYMENTS TO THIRD PARTY.

A lessee of certain mining property was required to pay to the lessor a stipulated royalty and was also obliged to pay a three per cent royalty to three other persons by reason of some former interest in the mining property. The lessee by a written agreement sold the mining lease to a purchaser for a stipulated sum and in connection with the sale and in consideration of the royalty due to the third persons the purchaser executed his several notes to such persons in payment of the surrender of their royalty rights. In an action to recover by one of the parties on a note so executed, the purchaser could not defeat a recovery on the ground that there was a failure of consideration in that the royalty contract was not a lien on the mining property, as represented.

Pate v. Mullen, —— Mo. App. ——, 209 Southwestern 291, p. 293.

COAL LEASES.

NATURE OF GRANT—SURFACE SUPPORT.

A coal lease conveyed to the lessee the absolute right to enter upon the leased lands and mine and remove the coal and to use the surface as fully as if the lessee owned the same. It expressly relieved the lessee from all liability from injury to the surface caused by mining operations. The terms of the lease were sufficient to show an intention on the part of the lessor to waive his right to the support of the surface and to relieve the lessee from any liability for injuries to the surface occasioned by his mining operations.

Weakland v. Cymbria Coal Co., —— Pa. ——, 105 Atlantic 558, p. 559.

GRANT OF RIGHT TO USE TIMBER—CONSTRUCTION.

A coal-mining lease gave the lessee the right to use the timber on the leased land within certain stated boundaries. This grant of the right to use the timber must be construed as intending only such use as may be necessary to effectuate the purpose of the demise. The right of appropriation is seldom enlarged into an unqualified ownership, such as authorizing a severance and a sale without regard to the right to use for mining purposes. Until such time as the lessee found it necessary to elect to exercise the right, the title to the timber remained vested in the lessor.

Paxton Lumber Co. v. Panther Coal Co., —— W. Va. ——, 98 Southeastern 563, p. 565.

See Godfrey v. Weyanoke Coal & Coke Co., —— W. Va. ——, 97 Southeastern 186.

PRIORITY OF MORTGAGE.

A coal lease on certain lands executed after the execution of a valid mortgage is subject to such mortgage. A judgment of foreclosure of the mortgage prima facie binds the entire estate, including the coal.

Reisinger v. Garrett Smokeless Coal Co., —— Pa. ——, 106 Atlantic 78, p. 79.

MORTGAGE AND LEASE—AGREEMENT AS TO PRIORITY—NOTICE TO PURCHASER.

A lessee of certain coal rights accepted a lease subject to a mortgage on the land. The mortgagee for a valuable consideration agreed that the lease should be prior and superior to his mortgage. But the landowner repudiated and refused to be bound by the agreement and the agreement was not properly recorded in the mortgage record. Subsequently the mortgage was foreclosed and notice of the foreclosure duly served on the coal lessee who was in possession of the land, but he failed to give notice to the purchaser of the priority of his coal lease. The improper record of the agreement to give priority to the coal lease was not constructive notice and the purchaser at the sheriff's sale had no actual knowledge of such agreement and obtained by his purchase an absolute title to the land, including the coal, together with the right of possession.

Reisinger v. Garrett Smokeless Coal Co., —— Pa. ——, 106 Atlantic 78, p. 80.

OIL AND GAS LEASES.

CONSTRUCTION—INTENTION OF PARTIES.

An oil and gas lease contained a clause in writing to the effect that if the lessee did not commence operations within one year the lease should be null and void. A printed clause in the lease provided that if the lessee failed to commence a well within one year he should pay a yearly rental of $82. In construing a lease containing such provision it is proper to look at the purposes and objects to be gained by its execution in order to ascertain the intent of the parties as expressed in the lease. The evidence shows that at the time of the execution of the lease it was agreed and understood that it should be null and void if operations were not commenced in a year. Such is the more natural, probable, and reasonable interpretation to be placed upon the lease, and the written provision should prevail over the printed part.

Johnston v. Shaffer, —— Okla. ——, 176 Pacific 901.

CONSTRUCTION—LANDOWNER FAVORED.

The construction of contracts or leases relating to oil and gas, where their terms admit of doubt or uncertainty, should favor the land owner, the lessor, because of the peculiar characteristics of these minerals.

Rechard v. Cowley, —— Ala. ——, 80 Southern 419, p. 421.

CONSTRUCTION—ONE DOLLAR CONSIDERATION.

A mining lease, in consideration of one dollar paid, granted to the lessee the oil and gas in and under the land described, and granted all other rights and privileges convenient for conducting mining operations, with the right of ingress and egress and the right of transportation of oil, gas, and water upon and from the described land. The nominal consideration of one dollar, the receipt of which was formally acknowledged, was effective and sufficient to support the obligation assumed by the lessor, whereby rights were conferred on the lessee.

Rechard v. Cowley, —— Ala. ——, 80 Southern 419, p. 420.

CONSTRUCTION—CONTRACTUAL CONSIDERATION—EFFECT.

Oil and gas leases are not dependent for their validity on an agreement to pay royalties and a consequent expressed or implied covenant to develop. They may be for any other consideration agreeable to the parties and valuable in law, or the consideration may be wholly executory, or it may be in money only, paid at the time of the execution and delivery of the instrument. The amount recited may be small, only one dollar, but a dollar is a unit of value and is a thing of value in fact and in the eyes of the law. One dollar is a sufficient consideration to support a conveyance of land, and if sufficient to support a conveyance of the whole estate in land it is sufficient to support a grant of a less interest. Where one dollar was the sole consideration paid for an oil and gas lease and the payment was recited in the instrument, the instrument would not be void. But aside from this it may be that development and prospective royalties are the real or moving consideration for such a lease. But this can not be where the parties expressly agree that development may be deferred for a stated time. One of the considerations and perhaps the principal one for such a grant is the covenant to develop and yield prospective royalties or pay the stipulated price in lieu thereof.

Rich v. Doneghey, —— Okla. ——, 177 Pacific 86, p. 91.
See Guffey v. Smith, 231 U. S. 101, 35 Supreme Ct. 526.
Eastern Oil Co. v. Beatty, —— Okla. ——, 176 Pacific 104.

CONSTRUCTION—JOINT AND SEVERAL COVENANTS.

A covenant in an oil and gas lease may be construed to be joint or several according to the interest of the parties appearing upon the face of the lease, if the words are capable of such construction; but the covenant will not be construed to be several by reason of several interests if it be expressly joint. This rule was applied to an oil and gas lease executed by a husband and wife as "parties of the first part," where the rentals were to be paid to the "parties of the first part." Under this ruling a payment of rentals to the wife was a discharge of the obligation although the title to the land was in the husband.

Jens Marie Oil Co. v. Rixse, —— Okla. ——, 178 Pacific 658.

CONSTRUCTION—VARIANCE BETWEEN WRITTEN AND PRINTED PORTIONS OF LEASE.

An oil and gas lease contained a printed provision to the effect that the lessee agreed to commence a well within twelve months from its date or pay the lessor a stipulated yearly rental. There was written in the lease immediately below this printed clause: ""The second party agrees to commence operations on this land within one year, otherwise this lease shall be null and void." The written portion, being at variance with the printed matter, must control and govern in the construction as best indicative of the intention of the parties.

Johnston v. Shaffer, —— Okla. ——, 176 Pacific 901.

CONSTRUCTION—UNILATERAL—MEANING.

The term "unilateral" is often used to express absence of mutuality, particularly in relation to oil and gas leases. Where contracts made up solely of mutual promises, each the consideration for the other, where the promises of one party are so expressed as not to be absolutely binding on him, but to be performed only if such party so wills, or a promise on but one side and no consideration therefor, the one making the absolute promise in the one case, or the sole promise of the other, is not bound to perform. The reason for this conclusion as sometimes given is that the contract is unilateral or void for want of mutuality; but the real reason is that there is not enough consideration for the promise. Consideration is essential, but mutuality of obligation is not unless the want of mutuality would leave one party without a valid or available consideration for his promise.

Rich v. Doneghey, —— Okla. ——, 177 Pacific 86, p. 90.

CONSTRUCTION—LEASE NOT UNILATERAL.

An oil and gas lease for a stated term required the lessee to drill a well within one year or thereafter to pay the lessor a quarterly rental in advance and give the lessor one-eighth of the oil and a stated sum for each gas well and permitted the lessee at any time to remove all his property and reconvey the premises, and provided that the payments made were to be retained by the lessor as the full damages for failure to comply with the lease. This lease was not subject to cancellation on the ground that it was unilateral in form and was therefore void for want of mutuality.

Hughes v. Parson, —— Ky. ——, 209 Southwestern 853.
See Killabrew v. Murray, 151 Ky. 345, 151 Southwestern 662.
Rechard v. Cowley, —— Ala. ——, 80 Southern 419, p. 421.

CONSTRUCTION—OPTIONAL AS TO ONE—RIGHT OF OTHER.

The rule that contracts unperformed without sufficient consideration which are optional as to one of the parties are optional as to both, applies to contracts or oil and gas leases consisting entirely of mutual promises wholly executory and unperformed. The promises on one side being the sole consideration for the promise on the other and in which if it is optional with one of the parties whether he will perform his promise, then prior to performance by him it is optional with the other whether he will perform his promise. The correct statement of the rule is that contracts unperformed, without sufficient consideration, which are optional as to one are optional as to both.

Rich v. Doneghey, —— Okla. ——, 177 Pacific 86, p. 91.
See Hill Oil & Gas Co. v. White, 53 Okla. 748, 157 Pacific 710.

CONSTRUCTION—NATURE OF ESTATE GRANTED.

A contract to explore and take and remove gas and oil is usually denominated a lease, but strictly speaking it is not such, but is in fact a grant in presenti of all the right to the oil and gas to be found in the lands described, with the right for the term named to enter upon the land and search therefor, and, if found, to produce and remove them according to the terms of the agreement. The grant implies, where it is not expressed, a right to occupy so much of the surface of the land as may be necessary for the purpose of exploration and production.

Rich v. Doneghey, —— Okla. ——, 177 Pacific 86, p. 90.

CONSTRUCTION—RIGHTS ACQUIRED BY LESSEE.

A lessee under an ordinary oil and gas lease acquires the right to go upon the premises, erect and maintain all necessary structures, and explore for oil and gas, and, if found, produce them according to the terms of the lease.

Rich v. Doneghey, —— Okla. ——, 177 Pacific 86, p. 95.

CONSTRUCTION—OIL AND GAS IN PAYING QUANTITIES—MEANING.

An oil and gas lease provided that one well was to be drilled to the top of the Mississippi lime unless oil or gas was found in paying quantities before the lime was reached, unavoidable accidents excepted. The phrase "oil or gas is found in paying quantities" taken in connection with other provisions of the lease must mean the finding of oil or gas in such quantities as would justify the expectation of a reasonable profit above the entire cost, including the cost of drilling and equipping the well.

Ardizonne v. Archer, —— Okla. ——, 178 Pacific 263, p. 264.

RIGHTS GRANTED—EXCLUSIVE PRIVILEGE.

An ordinary oil and gas lease is a grant of a present vested interest in land and gives the right for the term named of mining and operating on the described premises for oil and gas, which includes the right to explore therefor and extract therefrom and reduce to possession, as personal property, such as may be found in the land. It is a grant of the exclusive right for the time specified to take all the oil and gas that can be found by drilling wells upon the lands described, with the accompanying incidental right to occupy so much of the surface as may be required to do the things necessary to the discovery and for the enjoyment of the principal right to take oil and gas. Such a lease does not convey a vested interest in any oil or gas by reason of the nature of these substances, but only the right to search for and reduce to possession such as may be found; and after discovery, when reduced to possession, an estate therein as corporeal property would vest.

Rich v. Doneghey, —— Okla. ——, 177 Pacific 86, p. 89.

CONSTRUCTION—NATURE OF GRANT.

An oil and gas lease in consideration of one dollar granted to the lessee all the oil and gas in and under the tract of described land, with the right to operate thereon for oil and gas and the right to transport the oil and gas from the described premises. It is manifest that this lease was not intended to make a grant in presenti of the oil and gas as a part of the realty.

Rechard v. Cowley, —— Ala. ——, 80 Southern 419, p. 421.

NATURE—RIGHTS GRANTED—TITLE TO OIL—VALUATION.

An oil and gas lease carries with it not only the privilege of going upon the lands for the purpose of drilling, but the right to take therefrom during the continuance of the lease such oil and gas as may be found. Title to the oil and gas is vested by the lease in the lessee and it becomes his property of recognized value and he controls it and may dispose of it as his own. Not only is the oil or gas property, but the lease under which it is taken from the ground is property which has a substantial value and is the subject of frequent sale and is property that is subject to taxation.

Raydure v. Board, etc., Estill County, —— Ky. ——, 209 Southwestern 19, p. 24.
See Mt. Sterling Oil & Gas Co. v. Ratliff, 127 Ky. 1, 104 Southwestern 993, 31 Ky. Law. Rep. 1229.

MINIMUM TERM FOR EXPLORATION—ESTATE AT WILL.

An oil and gas lease granted the lessee all the oil and gas in and under the land described, with the right of conducting operations thereon and the right of transporting the oil and gas from the premises for a term of twelve years and as much longer as oil and gas are found in paying quantities. Such a lease does not create a tenancy at will as it fixed so far as the lessor was concerned a minimum term for the exploration and possession to accomplish the end.

Rechard v. Cowley, —— Ala. ——, 80 Southern 419, p. 421.

CONSTRUCTION—FAILURE TO DRILL WELL OR PAY RENTALS.

An oil and gas lease provided among other things that if a well was not commenced within one year the lease should be void unless the lessee should pay or tender to the lessor one dollar per acre for each additional year that such commencement was delayed. The lease was dated July 1, 1916, and no well was commenced during the first year and no rental was paid or tendered before July 1, 1917. The right to extend the lease existed on the payment of the rental and was not a consequence flowing from the original consideration alone. If the lessee desired to continue the lease he should have paid or tendered the rentals on or before July 1, 1917. If he wished to avoid paying the rentals by drilling operations, such operations should have been commenced before July 1, 1917. The lease compelled the lessee either to pay rent or commence drilling before July 1, 1917. He did neither, and under its terms the lease became null and void and subject to forfeiture.

Doornboss v. Warwick, —— Kan. ——, 177 Pacific 527.

CONSIDERATION—DELAY RENTALS—NO IMPLIED COVENANT TO DEVELOP.

No covenant to develop the land can be implied under an oil and gas lease in the face of an expressed stipulation for periodical payments for delay thereof not extending beyond a definite term. Development on other lands in the vicinity may show the premises to be situated in an oil and gas territory and prove the adaptability of the land for profitable mining operations but the lessor has no legal cause for complaining so long as he receives compensation for the delay for which he had contracted and the operations on neighboring lands do not drain the leased premises. Under such circumstances a court will not imply a covenant for diligent operation or operations at all. The lessor is deemed to have assented to the postponement through the several periods and bound to accept the periodical payments therefor.

Eastern Oil Co. v. Beatty, —— Okla. ——, 177 Pacific 104, p. 105.

CONSIDERATION—CASH BONUS—EFFECT ON COVENANTS.

By an oil and gas lease the lessee agreed to complete a well within twelve months or pay at the rate of $100 for each additional twelve months after such completion was delayed. The completion of a well was to operate as a full liquidation of rent during the remainder of the term of the lease. A cash bonus as a money consideration was paid for the lease at the time of its execution. A cash bonus paid for an oil and gas lease is a sufficient consideration to support each and all of the covenants in the lease.

Carter Oil Co. v. Tiffin, —— Okla. ——, 176 Pacific 912.

CONSIDERATION—MUTUALITY—TERMINATION.

A landowner executed an oil and gas lease for the sole purpose of mining for a term of five years, giving the lessee the right to operate for oil and gas, laying pipe lines, building tanks, power stations, and structures thereon and to procure and take care of the oil and gas.

A consideration of one dollar was named and the lessee was to deliver to the the lessor one-eighth of the oil and to pay a stipulated sum per annum for each gas well and for gas used from each oil well. The lessee was to complete a well within six months or pay at the rate of $15 for each additional month such completion was delayed. The lease gave the lessee the right at any time on payment of one dollar to the lessor to surrender the lease for cancellation and all liability thereunder was to cease. The consideration recited is sufficient to support the grant of the right to explore the land for oil and gas and to take and remove such as may be found. The agreement is not void for want of mutuality as it gave the lessee the right on compliance with the conditions expressed to terminate the lease; but the lessor could not terminate the lease at his pleasure on the theory that the instrument created a tenancy at will, within the rule that an estate at the will of one party is equally at the will of the other.

Rich v. Doneghey, —— Okla. ——, 177 Pacific 86, p. 89.
See Eastern Oil Co. v. Beatty, —— Okla. ——, 176 Pacific 104.

CONSIDERATION—MUTUALITY—SURRENDER CLAUSE—TERMINATION.

An oil and gas lease executed for a valuable consideration in the way of a cash bonus in addition to the covenant to develop and pay royalties or to pay rental in lieu of such development is valid and binding upon the lessor notwithstanding a surrender clause, and is not subject to cancellation by the lessor on the ground that the contract is unalateral and void for want of mutuality. The right given the lessee to terminate the lease does not confer a corresponding right of termination upon the lessor.

Eastern Oil Co. v. Beatty, —— Okla. ——, 177 Pacific 104, p. 105.

CONSIDERATION—OBLIGATIONS UPON LESSEE.

An oil and gas lease for a term of five years was for the stated consideration of one dollar and the lessee also agreed to pay certain stipulated royalties for the oil and for each gas well, and to complete a well within six months or pay $15 for each additional month the completion was delayed. The lease gave the lessee the right to surrender the lease at any time on payment of one dollar and all liabilities were to terminate. Such a lease is not unalateral on the theory that the lessee was not bound to do anything. On the contrary, his obligation was to do one of three things: (1) drill and complete a well in a fixed time; or (2) surrender all his rights and pay in addition the sum of one dollar; or (3) pay during the term of the lease, or until surrendered, $15 per month for each additional month the completion of a well was delayed. The lessee may escape from two of these obligations but he was absolutely bound to do one of the three. If he performed the first and failed to find oil and gas he suffered a detriment, and if oil and gas were discovered the lease conferred a benefit on the lessor by way of royalties. If the lessee performed the second he would suffer a detriment and confer a corresponding benefit on the lessor; but if he did neither of these he was absolutely obligated to the other and the amounts agreed to be paid for the delay could be recovered in an action by the lessor.

Rich v. Doneghey, —— Okla. ——, 177 Pacific 86, p. 90.

CONSIDERATION—DEVELOPMENT DELAYED INDEFINITELY.

An oil and gas lease provided that the lessee was to begin a well on the premises within one year of its date or pay at the rate of 25 cents an acre per year for each year such beginning was delayed. In such a lease the main consideration is the development of the property and the payment of royalty and the lessee can not as against the wishes of the lessor refuse to begin the development of the property for an unreasonable time and extend the lease indefinitely by the payment of a mere nominal rent.

Warren Oil & Gas Co. v. Gilliam, —— Ky. ——, 207 Southwestern 698.

PAYMENT OF DELAY RENTALS—FAILURE OF CONSIDERATION—RIGHT OF LESSEE.

A lease for oil and gas covered 280 acres alleged to be owned by the lessor; but as to 67 acres of the land described the lessor had title only to a one-half undivided interest in the oil thereunder. This variance as to the ownership is not such a total failure of consideration as to authorize the lessee to maintain an action to recover the delay rentals paid, in an action by him against the lessor as for money had and received.

Philadelphia Co. v. Shackelford, —— W. Va. ——, 98 Southeastern 568, p. 570.

OPERATIONS—EXTENT—DILIGENCE REQUIRED.

The large expense incident to the work of exploration and development and the fact that the lessee must bear the loss if the operations are not successful require that he proceed with due regard to his own interests as well as to those of the lessor. No obligation rests on him to carry the operations beyond the point where they will be profitable to him, even if some benefit to the lessor will result therefrom. It is only to the end that the oil and gas shall be extracted with benefit or profit to both that reasonable diligence is required. The rule is that whatever, under the circumstances, would be reasonably expected of operators of ordinary prudence, having regard to the interest of both lessor and lessee, is what is required.

Eastern Oil Co. v. Beatty, —— Okla. ——, 177 Pacific 104, p. 107.
See Hall v. South Penn Oil Co., 71 W. Va. 82, 76 Southeastern 124.

DELAY IN DEVELOPMENT.

An oil and gas lease required the lessee to begin a well within one year or pay at the rate of 25 cents an acre for each year the beginning of development was delayed. The lessee can not under such a lease refuse to begin the development of the property for an unreasonable time and extend the lease indefinitely by the payment of a mere nominal rent.

Warren Oil & Gas Co. v. Gilliam, —— Ky. ——, 207 Southwestern 698.

DUTY TO DEVELOP—INDEFINITE EXTENSION.

An oil and gas lease provided that the lessee was to begin a well on the premises within one year from the date of the lease, or pay a stipulated rental per year for each additional year such beginning was delayed. The main consideration of such a lease is the development of the property and the payment of the royalty and the lessee can not, in opposition to the wishes of the lessor, refuse to begin the development of the property for an unreasonable time and extend the lease indefinitely by the payment of a mere nominal rent.

Hughes v. Parson, —— Ky. ——, 209 Southwestern 858, p. 854.
See Warren Oil & Gas Co. v. Gilliam, 182 Ky. 807, 207 Southwestern 698.

FAILURE TO DEVELOP—LESSOR'S RIGHT TO FORFEIT.

An oil and gas lease recited as its consideration the receipt of one dollar and granted to the lessee for five years the land described, the lessee to give to the lessor one-eighth of the oil produced and to pay a stated sum per annum for each gas well, and the lessee was bound to complete a well within six months or pay at the rate of $15 for each additional month such completion was delayed. After the payment of the stipulated amount of one dollar and the payment of the $15 for two months as the delay rental where a well had not been completed within the time stated, and such sums received and accepted by the lessor, the lessor has not the option to refuse timely tenders of payments for delay in completing a well and terminate the grant, and can not maintain an action to compel a surrender of the lease.

Rich v. Doneghey, —— Okla. ——, 177 Pacific 86, p. 92.
Eastern Oil Co. v. Beatty, —— Okla. ——, 176 Pacific 104.

OFF-SET WELLS—LESSEE NOT REQUIRED TO DRILL.

There can be no implied covenant in an oil and gas lease by which a lessee is required to drill off-set wells, and a lessor can not under a lease in the absence of a covenant refuse further to accept delay rentals and compel the lessee to drill off-set wells or forfeit the lease where there was no evidence that an off-set well would be profitable to the lessee or any facts from which it could be reasonably inferred that operators of ordinary prudence having regard for the interest of both lessor and lessee would have drilled such wells; and where it was not made to appear that the oil that was being drawn from the lessor's land and that could have been saved by operating an off-set well, would pay the lessor sufficient royalty or bonus to equal the amounts to be paid in the way of delayed rentals. Under such circumstances it can not be said that there was drainage in a substantial sense and that there arose an obligation on the part of the lessee to prevent such drainage by drilling off-set wells.

Eastern Oil Co. v. Beatty, —— Okla. ——, 177 Pacific 104, p. 108.

OFF-SET WELLS—ACCEPTANCE OF DELAY RENTALS—RIGHT OF LESSOR.

A lessor of an oil and gas lease can not maintain an action to forfeit and have canceled an oil and gas lease that provided for delay rentals in lieu of drilling, on the ground of the failure of the lessee to drill off-set wells to prevent drainage of the leased premises, where the lessor has received and accepted payments of delayed rentals with knowledge of the drainage of the leased lands.

Eastern Oil Co. v. Beatty, —— Okla. ——, 177 Pacific 104, p. 106.

FAILURE TO DRILL OFF-SET WELLS—DRAINAGE—FORFEITURE.

It may be assumed that under an oil and gas lease for a ten-year period given for a valuable cash bonus but containing a provision for delay rentals an obligation to drill off-set wells during such period for the protection of the leased lands against drainage from wells operated on adjacent lands may be implied. Where the lessor in such lease demands that off-set wells be drilled and declines to accept further payments for delay in completing a well, a cancellation or forfeiture of the lease may be decreed if the lessee fails to drill such wells within a reasonable time. But a forfeiture or cancellation will not be decreed under circumstances where drilling such off-set wells would not reasonably be expected of operators of ordinary prudence, having regard for the interest of both lessor and lessee, and where the lessee makes timely tender of all payments due for delay of operations, and especially so where it reasonably appears that such off-set wells would not be profitable to the lessee and where it does not reasonably appear that the value of the interest of the lessor in the oil that probably could be saved from drainage by the off-set wells would substantially exceed the amount stipulated to be paid for delay in completing a well as provided by the lease.

Eastern Oil Co. v. Beatty, —— Okla. ——, 177 Pacific 104, p. 107.

DELAY RENTAL—PAYMENT OR TENDER—TIME OF MAKING.

An oil and gas lease provided that if the lessee did not drill a well within one year a stipulated rental was to be paid for each additional year the beginning of operations was delayed. Where no operations were commenced during the second year the stipulated rental was not due until the end of that year and the tender of the rental for the second year before the end of that year was sufficient to avoid forfeiture.

Hughes v. Parson, —— Ky. ——, 209 Southwestern 853, p. 854.
See Dicks River Barytes Co. v. Pence, —— Ky. ——, 123 Southwestern 263.

DELAY RENTALS—REFUSAL TO ACCEPT—EFFECT OF PROVISION.

Where an oil and gas lease is for a definite term and provides for the payment of a stipulated sum for delay during that term and that provision is still effective, the lessor can not refuse the stipulated payments for delay and recover damages, or invoke a forfeiture for a failure to develop on demand. This in fact would permit one party to the contract to demand and enforce immediate performance of which he has agreed may be deferred. A lessor suffers no injury in consequence of his inability to compel development under such circumstances except delay in realizing royalties upon oil and gas that might be produced. The oil and gas are still available for later operation and to the delay in producing that he has solemnly consented to by his contract for the compensation payable as stipulated.

Eastern Oil Co. v. Beatty, —— Okla. ——, 177 Pacific 104, p. 106.

DELAY RENTAL—TIME FOR PAYMENT—TENDER.

An oil and gas lease required the lessee to begin a well within one year or to pay at the rate of 25 cents an acre per year for each additional year such beginning was delayed. Under the lease the stipulated rental was not payable for the first year but only for each additional year the beginning of operations was delayed. It can not be inferred from the lease that the rental was payable in advance and if operations were not commenced during the second year, the stipulated rental was not due until the end of that year and a tender of the rental for the second year before the end of that year, according to the terms of the lease was sufficient to avoid a forfeiture.

Warren Oil & Gas Co. v. Gilliam, —— Ky. ——, 207 Southwestern 698, p. 699.

TENDER OF RENTALS—DEPOSIT IN BANK.

An oil and gas lease provided for the payment of one dollar per acre in advance for each additional twelve months after the first year that completion of a well should be delayed. It provided that payment should be made to the first party or deposited in a named bank to his credit. The lease also provided that the lessee should not be bound by any change in the ownership of the leased land until duly notified of such change, either by notice in writing or by the receipt of the original instrument of conveyance or a certified copy thereof. The lessor conveyed the premises by an ordinary deed to a third person and the deed was duly recorded. Under the lease the payment of the rental to the grantee as named in the deed of record or a deposit in the bank to his credit was a compliance with the terms of the lease and sufficient to prevent a forfeiture, although it was subsequently shown that the deed was only a mortgage.

Riddle v. Keechi Oil & Gas Co., —— Okla. ——, 176 Pacific 737, p. 739.

RECOVERY OF DELAY RENTALS.

To warrant recovery in an action of assumpsit by a lessee against the lessor in a lease for oil and gas of rentals paid by him for delay in drilling a well as for money had and received by the lessor for the use of the complainant, there must have been a total failure of consideration for such payment, or after an ejection by a third person, for mesne profits for the period for which rents have been paid.

Philadelphia Co. v. Shackelford, —— W. Va. ——, 98 Southeastern 568, p. 570.
See Gaffney v. Stowers, 73 W. Va. 420, 80 Southeastern 501.

SURRENDER CLAUSE—RIGHTS OF LESSOR AND LESSEE.

An oil and gas lease after reciting the covenants to be performed on the part of the lessee provided that the lessee should have the right at any time on payment of one dollar to the lessor to surrender the lease for cancellation and all liability thereunder should terminate. The lease also provided that the surrender clause and the option reserved to the lessee should cease and become inoperative upon the institution of any suit by the lessee to enforce any of the terms of the lease. If this option was not exercised the lessee would be bound by his covenants and if exercised the lessor would be free to deal with the premises as he chose. A surrender under this clause was not to affect any existing liability but only to avoid liabilities thereafter accruing. Such a surrender clause does not give the lessor the same option to surrender the lease on the theory that it creates a tenancy at will within the operation of the rule that an estate at the will of one party is equally at the will of the other.

Rich v. Doneghey, —— Okla. ——, 177 Pacific 86, p. 94.
See Eastern Oil Co. v. Beatty, —— Okla. ——, 176 Pacific 104.

SURRENDER CLAUSE—CONSIDERATION NOT NAMED.

A lessee in an oil and gas lease agreed to commence a well within one year or pay at the rate of one dollar per acre in advance for each additional twelve months the completion of the well was delayed. The lease also provided that the lessee should have the right at any time on payment of $— to the lessor to surrender the lease for cancellation and release and all liability should terminate. With the blank amount unfilled the lease is silent as to the amount of money which should be paid by the lessee for the privilege of surrendering the lease and it has no binding force or effect because the amount of the consideration to be paid was not inserted.

Riddle v. Keechi Oil and Gas Co., —— Okla. ——, 176 Pacific 737, p. 739.

SURRENDER CLAUSE—MUTUALITY.

An oil and gas lease provided that the lessee might, on payment of a stipulated amount, surrender the lease at any time for cancellation. This provision did not render the lease void for want of mutuality and the assignees of the lease may be held liable for the payments stipulated to be paid for delay in commencing a well.

Ardizonne v. Archer, —— Okla. ——, 177 Pacific 554, p. 555.
See Rich v. Doneghey, —— Okla. ——, 177 Pacific 86.
Overruling Brown v. Wilson, —— Okla. ——, 160 Pacific 94.

MUTUALITY—SURRENDER CLAUSE—RIGHT TO SURRENDER.

The fact that an oil and gas lease contains a "surrender clause" does not give the lessor the right to refuse to accept rentals and demand a surrender and cancellation of the lease.

Gypsy Oil Co. v. Van Slyke, —— Okla. ——, 178 Pacific 683, following Northwestern Oil & Gas Co. v. Branine, —— Okla. ——, 175 Pacific 533.

SURRENDER CLAUSE—MUTUALITY—TERMINATION.

An oil and gas lease provided among other things that upon the payment of a further sum of one dollar the lessee should have the right to surrender the lease for cancellation and all liabilities thereafter to accrue should cease and terminate. A cash bonus was paid for the lease and the lessee was required to drill a well within one year or pay a stipulated amount for each year completion was delayed. The presence of the surrender clause in the lease does not render the lease void for want of mutuality nor does it confer on the lessor the right to terminate the lease at will.

Carter Oil Co. v. Tiffin, —— Okla. ——, 176 Pacific 912, p. 913.
See Northwestern Oil & Gas Co. v. Branine, 8 Okla. App. 489, 175 Pacific 533.

SURRENDER CLAUSE—OPTION—MUTUALITY—EFFECT AND VALIDITY.

The option to surrender an oil and gas lease can not be declared inequitable. In case it was not exercised the lessee would be bound by his covenants and if exercised the lessor would be free to deal with the premises as he chose. A surrender was not to affect any existing liability but only to avoid those thereafter to accrue. A lease containing a surrender clause is not void for want of mutuality.

Rechard v. Cowley, —— Ala. ——, 80 Southern 419, p. 421.

CONTRACT OF SALE—APPROVAL OF TITLE—PRESUMPTION.

A contract for the purchase of an oil lease provided that an abstract of title should be submitted to a certain named attorney for approval. On submission of the abstract the attorney examined and disapproved the title and so reported. In such case the presumption is that the attorney in the examination of the title acted in good faith.

First National Bank v. Clay, —— Okla. ——, 177 Pacific 115, p. 118.

CONTRACT FOR SALE OF LEASE—APPROVAL OF TITLE.

A contract for the sale of an oil and gas lease provided that the lessor should submit to the attorney of the lessee a complete abstract of title to the leased land and that the lease should take effect and the mutual obligations of the parties become binding on the approval of the abstract by the attorney. The abstract was furnished and was examined by the attorney within a reasonable time and the title to the land was disapproved by the attorney. A vendee can not be compelled to accept a title that his attorney in good faith refused to approve where by the contract of purchase the title was to be approved by the attorney of the purchaser. The opinion of the attorney under such circumstances is final and binding in the absence of fraud or bad faith.

First National Bank v. Clay, —— Okla. ——, 177 Pacific 115.

CONTRACT OF PURCHASE—CONSTRUCTION—APPROVAL OF TITLE—DEPOSIT OF EARNEST MONEY.

A contract for the purchase of an oil and gas lease required the lessor to submit to a certain named attorney a complete abstract of title to the leased land and that the lease should take effect and the obligations of the parties accrue "only in case such attorney should approve the title to the land." The contract provided that the lessee should deposit in a bank $1,500 as earnest money and on the failure of the lessee to comply with the contract in beginning work as agreed, the money should be paid to the lessor as liquidated damages. On the submission of the abstract of the title the attorney disapproved the title. The reasonable conclusion from the language of the contract is that in the event of the approval of the abstract the contract should be effectual and binding but in the event of the disapproval of the title the contract should not take effect. The mutual obligations of the parties should accrue only in the case of the approval of the title. A bank was not authorized to pay the deposit to the lessor after the disapproval of the title and the lessee was entitled to recover from the bank and the lessor.

First National Bank v. Clay, —— Okla. ——, 177 Pacific 115, p. 117.

CONTRACT OF PURCHASE—CONSTRUCTION—ATTORNEY'S DECISION AS TO TITLE.

In a contract for the purchase of an oil and gas lease the parties have the right to provide that an arbitrator's decision in the absence of fraud, should be final, and they have a right to stipulate that the attorney of the purchasing party should be the exclusive and final judge as to whether or not the title was defective. In such case courts will leave the parties to abide by the contract as made and no bad faith will be presumed even if the attorney selected was interested in the subject matter of the contract.

First National Bank v. Clay, —— Okla. ——, 177 Pacific 115.

APPROVAL OF TITLE—BURDEN OF PROOF AS TO BAD FAITH.

A contract for the purchase of an oil and gas lease provided that a certain named attorney should approve the title as shown by a complete abstract to be submitted to him by the lessor. In an action by the lessor to enforce the sale after the title has been refused by the attorney, the burden was upon the lessor to prove that the lessee or the attorney acted in bad faith in rejecting the title.

First National Bank v. Clay, —— Okla. ——, 177 Pacific 115.

AGREEMENT TO PURCHASE—JOINT OWNERSHIP—PARTNERSHIP.

A mere agreement between two or more persons by which they were to purchase and own jointly such oil leases in a particular field that might be submitted to and agreed upon by them, does not create a general partnership as to all leases purchased, or owned by either of the parties, and one of the parties can not claim an interest in a lease acquired by another one where the price was paid by the purchasing party, none of the expenses were ever assumed or paid by the alleged partnership, and where no claim was made to the lease until long after its purchase and when its value was greatly enhanced.

Gorman v. Carlock, —— Okla. ——, 179 Pacific 38, p. 41.

FRAUDULENT SALE—RATIFICATION—REMEDY OF BUYER.

An oil company was induced to purchase an oil and gas lease through the fraudulent representations of the agent of another oil company. The price agreed to be paid, due to the fraudulent representations, was some three times the actual value of the property. After the purchase the officers and stockholders of the purchasing company repeated the representations to third persons in order to sell stock and finance the company. The purchasing company owing to its financial distress did not rescind the contract of purchase immediately on discovering the fraud. The peculiar circumstances of the case and in view of the fact that many of the innocent stockholders who were not parties to the transaction would suffer by reason of the fraud justified a decree authorizing an abatement in the price, reducing it to the actual value of the property at the rate of value the parties contracted to pay if the lease had been as represented and on a basis of a 255 barrel daily production.

Barnett Oil & Gas Co. v. New Martinsville Oil Co., 254 Federal 481, p. 488.

PURCHASE BY FOREIGN CORPORATION—VALIDITY NOT DETERMINED.

A stipulation of facts failed to show in what State a contract was made and executed by which a foreign oil company acquired certain oil leases. In the absence of such a stipulation the court will not pass upon the validity or invalidity of the leases, and especially so where the adverse party only contests the right of a foreign corporation to enforce rights which it claims to have growing out of the leases.

Hays v. West Virginia Oil & Gas & By-Products Co., —— Ky. ——, 210 Southwestern 174.

LESSOR'S RIGHT TO FORFEIT—NOTICE REQUIRED.

An oil and gas lease gave the lessee the right to enter upon the premises and drill for and remove therefrom oil and gas for a period of five years, and as much longer as oil or gas was found, with the right to use the oil or gas, or water, and all rights and privileges necessary or convenient for the operation and the right to remove at any time all improvements and pipes placed upon the land. The lessee was required to drill a well within one year or thereafter to pay the lessor quarterly 25 cents per acre in advance until a well was completed. If oil was found in paying quantities, the lessor was to have one-eighth and if gas was found he was to have $100 every year for the product of each well. If the lessee unreasonably delayed the beginning of operations, the lessor in order to obtain a forfeiture of the lease must notify the lessee that he will not accept the stipulated annual rental and demand immediate performance of the covenants of the lease; and if the lessee does not then begin performance in good faith within a reasonable time the lessor may have the lease cancelled.

Hughes v. Parson, —— Ky. ——, 209 Southwestern 853, p. 855.
See Warren Oil & Gas Co. v. Gilliam, 182 Ky. 807, 207 Southwestern 698.

RIGHT TO FORFEIT FOR NONDEVELOPMENT—NOTICE AND DEFAULT.

The right of a lessor to forfeit an oil and gas lease for nondevelopment can not arbitrarily be exercised. The lessor must first notify the lessee that he will no longer accept the annual rentals and will require the lessee to develop the land in good faith according to the intention of the parties. After such notice and demand if the lessee fails to begin the development within a reasonable time, the lessor may then have the lease forfeited.

Hughes v. Parsons, —— Ky. ——, 209 Southwestern 853, p. 854.

FORFEITURE—RIGHT AND DUTY OF LESSOR.

The right of a lessor to forfeit an oil and gas lease for nondevelopment can not be arbitrarily exercised. In order to forfeit the lease, the lessor must first notify the lessee that he will no longer accept the annual rents and permit his land to remain idle and undeveloped but will require the lessee to execute the contract according to the intention of the parties by beginning the development in good faith and if after such notice and demand the lessee fails to begin the development within a reasonable time the lessor may then have the lease forfeited.

Hughes v. Parson, —— Ky. ——, 209 Southwestern 853, p. 854.
See Monarch Oil, Gas & Coal Co. v. Richardson, 124 Ky. 602, 199 Southwestern 663.

LOCATION OF WELLS—VIOLATION OF CONDITION—FORFEITURE—INJUNCTION.

An oil and gas lease provided that no wells were to be drilled within 200 feet of the buildings on the leased premises without the consent of the lessor. During the develpment of the land by the lessee and over the objections of the lessor the lessee located and drilled a well within the prohibited 200 feet with full knowledge that the well was located within the prohibited distance. The lessor was entitled to an injunction perpetually restraining the lessee from operating the well so drilled and from entering upon or in any manner using any ground within 200 feet of the buildings thereon.

Kelly v. S. W. Phillips Oil & Gas Co., —— Pa. ——, 105 Atlantic 631, p. 632.

SEQUESTRATION OF OIL—FORFEITURE OF LEASE.

A court would not order an oil lease and the property of the operator sequestered and the operations suspended and development stopped on the mere allegation that the operating company had failed to make a payment and thereby forfeited its rights, where such allegations are expressly denied and where the operating company has been in possession and is entitled to possession under its lease.

Dickison v. Texana Oil & Refining Co., 144 La. ——, 80 Southern 669.

CANCELLATION—LEGAL REMEDY.

A lessor in an oil and gas lease can not maintain an action to cancel a lease for violation of its covenants, where the lessor had his remedy by common law action of ejectment, and where it appeared that the lessee had acquired an undivided half interest in the premises.

Patterson v. United Natural Gas Co., —— Pa. ——, 105 Atlantic 828.

LESSOR'S RIGHT TO CANCELLATION.

The terms, stipulations, and conditions of an oil and gas lease were clear, certain, unambiguous, and there was no trick, artifice, or deception on the part of the lessee to procure the execution of the lease and no necessary stipulations were inadvertently or fraudulently omitted. The lessor, a man of ordinary intelligence and able to read and fully understand all the terms of the lease, was not entitled, under the evidence, to a decree canceling the lease.

Freeman v. McKay, —— Ga. ——, 98 Southeastern 263.

GUARANTEE AGAINST INCUMBRANCES—SUBLEASE.

An oil and gas lease provided that all the expenditures in connection with the boring of wells, erecting derricks, pumps, tanks, pipes, and material, should be provided by the lessee at his own expense; and the lessee expressly agreed that he would keep the premises clear and free of incumbrances and liens, particularly mechanics', material men's, and laborers' liens. There was no agreement in the lease against subletting and the lessee had a right to sublease portions of the land for the development of oil and a sublease could not be considered an incumbrance within the meaning of the lease.

Smith v. United Crude Oil Co., —— Cal. ——, 178 Pacific 141, p. 142.

SUBLEASE—RIGHT OF ORIGINAL LESSOR—PROPER REMEDY.

A lessee of certain oil and gas lands sublet a portion of the leased premises to a third person. The original lease contained a covenant against incumbrances. The lessor brought suit to recover the rents collected from a subtenant and to forfeit the original lease on the ground that the subletting was for a purpose not contemplated by the provisions of the lease and was an incumbrance in violation of the covenants of the lease. The complaint made no claim for damages nor was any proof offered of any damages by reason of the subletting and of the alleged improper use of the premises by the sublessee. The Civil Code of California (Section 1930) provides that when a thing is let for a particular purpose the hirer must not use it for any other purpose, and if he does he is liable for all damages and the lessor may treat the contract as rescinded. Under this section of the code the lessor could only maintain an action for damages, and he could not sue to recover rents received from the sublessee and have the original lease rescinded; nor could he on appeal change the theory of his action and insist that it was an action for damages.

Smith v. United Crude Oil Co., —— Cal. ——, 178 Pacific 141, p. 142.

SECOND LESSEE—NOTICE—PRIORITY—INTEREST AND INJUNCTION.

A second lessee in an oil and gas lease of certain described lands had actual and constructive notice of a prior existing lease of the same lands. Such a second lessee acquired no rights under his lease as against the lessee of the prior lease. Under these circumstances the original lessee had the right to have his title to the oil and gas under the leased lands quieted as against the second lessee and to have such second lessee enjoined from interfering with his right to enter upon the land and mine and remove the oil.

Warren Oil & Gas Co. v. Gilliam, —— Ky. ——, 207 Southwestern 698, p. 699.

DEATH OF LESSOR—POSSESSION OF HEIRS.

The owner of land leased the same for oil and gas for a period of two years and as long thereafter as oil and gas should be found in paying quantities. The lessee failed to drill on the land but drilled a producing well believed to be on adjoining lands, but subsequently the well was discovered to be on the leased lands. After the death of the lessor and after the expiration of two years from the date of the original lease the heirs executed a second lease to a third person but continued to receive the royalty from the well operated by the first lessee on the assumption that the well was on the land leased by their ancestor. Under these facts the lease to the original lessee was recognized as valid and continuing and he was entitled to the leased premises as against the second lessee of the heirs.

Powell v. Schoenfield, —— Pa. ——, 106 Atlantic 110, p. 111.

LEASE BY HUSBAND AND WIFE—JOINT OBLIGATION—PAYMENT TO ONE.

A husband and wife executed an oil and gas lease as "parties of the first part," as the interest of the lessors might appear. The lease provided that the rentals were to be paid "to the parties of the first part." The lease contained no provisions defining the interests of the lessors, but in law they were joint obligees and the payment of the rentals to the wife was a discharge of the obligation, although the record title to the land was in the husband.

Jens Marie Oil Co. v. Rixse, —— Okla. ——, 178 Pacific 658.
See Freeman v. Swiger, —— W. Va. ——, 98 Southeastern 440.
Allen v. South Penn Oil Co., 72 W. Va. 155, 77 Southeastern 905.

BREACH OF EXPRESSED COVENANT TO DRILL—MEASURE OF DAMAGES.

An oil and gas lease provided that one well was to be drilled to the top of the Mississippi lime unless oil or gas was found in paying quantities before the lime was reached. The lessee failed to perform the covenant to drill a well to the Mississippi lime and in an action for damages the lessor could not recover the cost of casing, tubing, and other equipment, as this was not a proper element of damages, as the casing, tubing, and equipment would have been the property of the lessee to be by him removed, but the lessor was entitled to compensation only for the cost of drilling.

Ardizonne v. Archer, —— Okla. ——, 178 Pacific 263, p. 266.

SCHOOL LANDS—AUTHORITY TO LEASE.

A tract of land was conveyed to the proper school authorities for "school purposes only." This did not create a conditional estate but conveyed to the school district an estate in fee simple including the oil and gas. The grantee had power under such a conveyance to execute a valid oil and gas lease for the land described.

T. W. Phillips Oil & Gas Co. v. Lingenfelter, —— Pa. ——, 105 Atlantic 888, p. 889.

VALUATION AND ASSESSMENT.

An oil and gas lease by which the lessee is granted the privilege of drilling for and producing oil, if it can be found on the premises, is property and is regarded as a thing of value and is subject to taxation.

Raydure v. Board, etc., Estill County, —— Ky. ——, 209 Southwestern 19, p. 23.

DRILLING WELL NEAR RAILROAD—STATUTE PROHIBITING.

The fact that an oil and gas lease covered a strip of ground from 37 to 50 feet wide adjoining the right-of-way of a railroad and that the lease would be valueless under the statute of Kansas (General Stats. 1915, sec. 4979) prohibiting the drilling and operating oil and gas wells within 100 feet of the right-of-way of any railroad, can have no effect on determining the validity or invalidity of the statute. The statute is valid as an exercise of police power.

Winkler v. Anderson, —— Kans. ——, 177 Pacific 521, p. 522.

MINING PROPERTIES.

TAXATION.

VALUATION—PERSONS COMPETENT TO MAKE.

Mining property consisting of a developed and proved coal mine operated for commercial purposes and surrounding coal lands in a prospective stage, partially proven to be coal lands, may be given an assessed valuation not as a mine, but as a prospect, where the assessing officers have reason to find and believe that the property has coal values.

Washington Union Coal Co. v. Thurston County, —— Wash. ——, 177 Pacific 774, p. 775.

COMPETENCY OF TAXING OFFICERS TO MAKE VALUATION.

A county assessor and a board of equalization are not required to be mining experts nor are they required to employ experts to properly and legally assess mining property as a prospect, where there is reason for the officers to find and believe that the property has coal values.

Washington Union Coal Co. v. Thurston County, —— Wash. ——, 177 Pacific 774, p. 775.

REASONABLENESS OF VALUATION—PRESUMPTION—BURDEN OF PROOF.

Valuations placed upon coal lands and mining properties by taxing officers are presumed to be reasonable, and one who challenges such valuations assumes a task not measured or accomplished with less than clear and convincing proof.

Washington Union Coal Co. v. Thurston County, —— Wash. ——, 177 Pacific 774, p. 775.

OIL LEASE AS PROPERTY.

A lease granting the right to enter upon land for the purpose of drilling for oil and gas, and if found to remove and market the same, extending for a period of five years or so long thereafter as oil or gas is found and produced, is property within the meaning of the Kentucky statute, and as such is subject to taxation.

Raydure v. Board, etc., Estill County, —— Ky. ——, 209 Southwestern 19, p. 22.

OIL LEASE—TAXATION AT CASH VALUE.

An oil lease giving the lessee the privilege of drilling for and producing oil, if it can be found on the leased premises, has a cash value in some amount and this value can be ascertained by offering it for sale; and the lease should be assessed for taxes at its fair cash value, estimated at the price it would bring at a fair voluntary sale. It would be a violation of the constitution to hold that an oil lease having a cash value and that could be sold on the open market for cash in some amount at a fair, voluntary sale, was not assessable property.

Raydure v. Board, etc., Estill County, —— Ky. ——, 209 Southwestern 19, p. 23.

See Wolfe County v. Beckett, 127 Ky. 252, 105 Southwestern 447, 33 Ky. Law Rep. 167.

OIL-PRODUCTION TAX—NATURE.

The statute of Kentucky (Section 4223c, Acts 1917), provides that every person or corporation producing crude oil shall, in lieu of all other taxes on wells producing oil, pay, for State purposes, an annual tax of one per centum of the market value of the oil produced. The statute also authorizes counties to impose a like tax for road and other purposes. The tax imposed by this act was intended as a license tax and the tax was not intended to make any classification of property within the meaning of the constitution and it was not intended that the production tax should be in lieu or a substitute for an ad valorem tax.

Raydure v. Board, etc., Estill County, —— Ky. ——, 209 Southwestern 19, p. 24.

PRODUCTION TAX AND AD VALOREM TAX.

The constitution of Kentucky (Section 171) gives the general assembly power to divide property into classes and to determine what classes of property shall be subject to taxation. Section 181 of the constitution provides that the general assembly may by general laws only provide for the payment of license fees on franchises, the various trades, occupations, and professions. The act of 1917 as amended by the act of 1918 imposing a license on persons engaged in the production of crude oil was passed pursuant to the mandate of Section 181, but this license tax could not take the place of the ad valorem tax provided for under Section 171.

Raydure v. Board, etc., Estill County, —— Ky. ——, 209 Southwestern 19, p. 25.

LICENSE TAX—VOLUME OF OIL PRODUCED.

The legislature under the constitution of Kentucky has power to fix a reasonable license tax to be determined by volume of oil produced. The tax imposed is not levied upon the property but is simply a license tax which the constitution authorizes the legislature to impose, and the legislature may impose such a tax even in the absence of constitutional authority.

Raydure v. Board, etc., Estill County, —— Ky. ——, 209 Southwestern 19, p. 26.

DOUBLE TAXATION—FRANCHISE AND AD VALOREM TAX.

The provisions of the constitution and the statutes of Kentucky relating to an ad valorem tax on oil and gas leases and the provisions relating to a production tax on oil, result in double taxation on the owner of an oil and a gas lease who is also the owner of an oil-producing well on the leased lands, as his oil lease is subject to an ad valorem tax and the oil produced to a license production tax. This result does not render the scheme of taxation invalid as many persons and especially professional people who pay ad valorem taxes are also subject to license taxes.

Raydure v. Board, etc., Estill County, —— Ky. ——, 209 Southwestern 19, p. 26.

FAILURE TO ASESS OTHER PROPERTIES.

The owner of coal lands consisting of a proven mine and surrounding coal lands as a prospect can not be released from taxation of such mine and lands because other lands in the community are not assessed for coal values where the proof fails to show lack of foundation for the difference in the opinion and judgment of the assessing officers.

Washington Union Coal Co. v. Thurston County, —— Wash. ——, 177 Pacific 774, p. 776.

TRESPASS.

CONVERSION OF COAL—MEASURE OF DAMAGES.

Under a charge of mining and taking coal where the taking was tortious, the measure of damages ordinarily is the value of the coal in place and not the value at the tipple, less the expense of mining and conveying it there.

Matthews v. Rush, —— Pa. ——, 105 Atlantic 817, p. 818.

MINING AND REMOVING COAL—TREBLE DAMAGES—ACTUAL KNOWLEDGE.

The Pennsylvania Act of 1876 (P. L. 142) imposes treble damages for removal of coal "knowing the same to be upon the lands of another." A recovery of treble damages under the act is conditioned on actual knowledge. Under this statute the knowledge of the superintendent of a mine owner and operator was not sufficient to make the mine owner liable in treble damages in the absence of proof of actual knowledge on his part. The rule that the knowledge of an agent is binding upon his principal does not apply under such a statute.

Matthews v. Rush, —— Pa. ——, 105 Atlantic 817, p. 818.

MEASURE OF DAMAGES—INSUFFICIENT VERDICT.

The owner of a mining claim sued the owner of the adjoining claim in trespass for mining and removing ore from a vein that apexed within the claim of the plaintiff. In such case the measure of damages, if the trespass was wilful, is the full value of the ore taken; but if the trespass was an innocent one, the measure of damages is the value of the ore in place, or the value of the ore after its removal, less the actual cost of mining, transporting, and reducing the ore.

Original Sixteen-to-One Mine v. Twenty-One Min. Co., 254 Federal 630, p. 632.

DEFECTIVE VERDICT—NEW TRIAL AS TO SINGLE ISSUE.

The owner of a mining claim sued the owner of an adjoining claim for damages for mining and removing ore from a vein that apexed within the surface lines of the plaintiff's claim. The court instructed the jury that if the trespass was an innocent one the measure of damages was the value of the ore in place or the value of the ore after its removal less the actual cost of mining, transporting, and reducing the ore. The jury returned a verdict assessing the damages against the defendant in the sum of $100,000 "less the cost of extraction of the ore, on account of unwilful trespass." The cost of mining the ore was shown to be $46,315.58 and the plaintiff moved for a judgment on the verdict for the sum of $100,000 less the sum shown as the cost of mining. The defendant asked for a new trial on the ground that the verdict was indefinite, uncertain, and void. Under such circumstances it would not be in the interest of justice or the exercise of a wholesome discretion to try the case over in its entirety and the court has the power to grant a new trial as to a single issue. Accordingly the verdict was permitted to stand in so far as it found the issues in favor of the plaintiff and a new trial was awarded for the sole purpose of assessing the amount of recovery.

Original Sixteen-to-One Mine v. Twenty-One Min. Co., 254 Federal 630, p. 632.

DAMAGES FOR INJURIES TO MINERS.

ELEMENTS OF DAMAGES.

COMPENSATION—ACTUAL DAMAGES.

Damages are defined to be the compensation which the law will award for an injury done. Actual damages are such compensation for an injury as would follow from the nature and character of the act and which the injured party is entitled to recover for the wrongs done and the injuries received when none were intended. Actual damages are such losses as are actually sustained and are susceptible of ascertainment.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 177 Pacific 29, p. 33.

The liability of an employer for personal injuries sustained by an employee from an accident arising out of and in the course of the employment in hazardous occupations as specified in the Arizona Employers' Liability Law, is such an amount as will compensate an employee for the injuries sustained by him directly attributable to such accident.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 177 Pacific 29, p. 32.

REASONABLE COMPENSATION.

No fixed rule exists for estimating the amount of damages to be recovered by one permanently disabled from laboring through the negligence of another. A jury should award a fair and reasonable compensation, taking into consideration what the plaintiff's income would probably have been, how long it would have lasted, and all the contingencies to which it was liable.

Inspiration Consol. Copper Co. v. Lindley, —— Ariz. ——, 177 Pacific 24, p. 26.

INSTRUCTION AS TO ELEMENTS TO BE CONSIDERED—GROUND OF OBJECTIONS.

In an action for damages for personal injuries the court instructed the jury to the effect that in arriving at the amount of the plaintiff's damages they could consider the nature and extent of his injuries, whether these were permanent or temporary, the disfigurement of his person, bodily pain, and mental suffering he had endured and is reasonably certain to endure, the loss of earnings since the injury and the loss of earnings, if any, in the future of his life, by virtue of his alleged decreased capacity, his age and reasonable expectancy of life, his vocation and earning capacity prior to his injury, and his probable chance, if any, of increased earnings had he not been injured. This instruction was subject to criticism on the ground that the probable chance of increased earnings, had the plaintiff not been injured, is necessarily included in the element of "loss of earnings, if any, in the future of his life." This clause of the instruction could be misunderstood as a general element to be considered by the jury and might serve to mislead them, but no complaint was made to the effect that the verdict was excessive because of this instruction.

Inspiration Consol. Copper Co. v. Lindley, —— Ariz. ——, 177 Pacific 24, p. 27.

INJURIES PERMANENT—QUESTION OF FACT.

It can not be determined as a matter of law that an injury to a miner was not permanent, and notwithstanding the statement of the physician to the contrary it was a question of fact for the jury to determine.

Sloss-Sheffield Steel & Iron Co. v. Bearden, —— Ala. ——, 80 Southern 42, p. 44.

MENTAL AND PHYSICAL SUFFERING—LOSS OF TIME—EXPENDITURES.

Mental and physical suffering experienced by an injured employee, proximately resulting from the accident, the reasonable value of working time lost, the necessary expenditures for the treatment of injuries and compensation for the employee's diminished earning power directly resulting from the injury and any other result causing direct loss, are matters of actual loss and as such recoverable.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 177 Pacific 29, p. 33.

INSTRUCTION AS TO EXPECTANCY OF LIFE—LIFE TABLES—JUDICIAL NOTICE.

In an action for damages for the death of a miner the court instructed the jury as to the number of years of the life expectation of the deceased according to the American table of experience, but the instruction was given as a suggestion and was not to be binding upon the jury. Such an instruction is not erroneous on the ground that the life tables were not introduced in evidence. Courts take judicial notice of these tables and it is not error to instruct a jury concerning them though they are not in fact introduced in evidence.

Medley v. Parker-Russell Min., etc., Co., —— Mo. App. ——, 207 Southwestern 887, p. 890.

LOSS OF EARNING CAPACITY.

An injured person may recover for loss or diminution of his earning capacity during his entire expectancy of life and he is entitled to recover such an amount as will compensate him for such loss. A jury in estimating the damages may consider how far an injury will in all probabilities disable the complainant from engaging in pursuits and occupations for which in the absence of the injury he would have been qualified.

Inspiration Consol. Copper Co. v. Lindley, —— Ariz. ——, 177 Pacific 24, p. 26.

DECREASED EARNING CAPACITY—ABSTRACT CHARGE.

In an action for injuries no claim was made for damages on account of decreased earning capacity, but the court properly refused a requested instruction to the effect that only nominal damages could be recovered on account of decreased earning capacity because of no demand for such damages.

Sloss-Sheffield Steel & Iron Co. v. Thomas, —— Ala. ——, 80 Southern 69, p. 70.

RECOVERY BY MINOR—MEASURE OF DAMAGES.

In an action by an unemancipated infant for personal injuries, damages for the consequent impairment of earning capacity during the minority are not recoverable, as the parents are entitled to such earnings.

Sloss-Sheffield Steel & Iron Co. v. Bearden, —— Ala. ——, 80 Southern 42, p. 44.

FORMER INJURY—INSTRUCTION.

In an action by a miner for damages for an injury to his arm, it was proper for the court to instruct the jury not to allow damages for a former injury or for any aggravation of the last injury by the first, but the instruction confined the recovery to such damages only as were shown to have resulted directly from the last injury.

Tway Min. Co. v. Tyree, —— Ky. ——, 208 Southwestern 817, p. 820.

PROOF—OPINION OF PHYSICIAN.

In an action by a miner for damages for injuries received in mining operations, the opinion evidence of an attending physician as to the nature of the injuries and whether permanent or temporary is competent on the question of damages.

Barna v. Gleason Coal & Coke Co., —— W. Va. ——, 98 Southeastern 158, p. 159.

INTENTIONAL WRONG—RECOVERY OF DAMAGES.

In determining the damages, if any intentional wrong was committed by the employer by reason of which wrong the employee's loss was augmented, such loss is no part of the "damages" recoverable in an action under the Employers' Liability Law of Arizona. The reason of this is that the injury arising from an intentional wrong did not arise from the risks and hazards inherent in the occupation and that are unavoidable by the employee therein engaged, but arose from the fault, negligence, or active intentional wrong of the employer.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 177 Pacific 29, p. 32.

PUNITIVE DAMAGES NOT RECOVERABLE.

Where humiliation and mortification furnish grounds for the recovery by an injured employee the right of recovery depends upon whether the employer purposely and designedly committed the wrong, thereby intending to humiliate the employee and outrage his feelings. The damages recoverable for such wrong are punitive in character and furnish no grounds for recovery in an action under the Employers' Liability Law of Arizona for the reason that such character of damages do not amount to actual damages but to punitive damages.

Arizona Copper Co. v. Burciaga, —— Ariz. ——, 177 Pacific 29, p. 33.

FUTURE PAYMENTS—PRESENT WORTH.

In an action by a miner for personal injuries occasioned by the alleged negligence of the mine operator, an instruction was held to be proper to the effect that the rule that future payments are to be capitalized and that only the present worth of such future payments are to be awarded does not apply to damages recoverable on account of pain and suffering and inconveniance that the miner suffered by reason of the injury.

Ford v. Philadelphia & Reading Coal & Iron Co., —— Pa. ——, 105 Atlantic 885, p. 886.

Sebastian v. Philadelphia & Reading Coal & Iron Co., —— Pa. ——, 105 Atlantic 887, p. 888.

EXCESSIVE DAMAGES—BASIS FOR DISTURBING.

A court on appeal can only disturb a verdict of a jury for excessive damages where it appears that the damages are so excessive that the award can not be sustained on any other theory than that it was the result of passion or prejudice on the part of the jury.

Inspiration Consol. Copper Co. v. Lindley, —— Ariz. ——, 177 Pacific 24, p. 27.

QUESTION NOT PRESENTED.

The question of excessive damages can not be properly presented to the court on appeal unless it is alleged as a ground for a new trial.

Calumet & Arizona Min. Co. v. Chambers, —— Ariz. ——, 176 Pacific 839, p. 843.

DAMAGES NOT EXCESSIVE.

INSTANCES.

A verdict for $700 can not be said to be excessive where there was practically total impairment of the use of the miner's right arm, in addition to the physical and mental suffering, loss of time and expense of cure.

Tway Min. Co. v. Tyree, —— Ky. ——, 208 Southwestern 817, p. 820.

A verdict of $4,000 is not excessive where a young miner had his foot mashed by being run over by a tram car.

Sloss-Sheffield Steel & Iron Co. v. Bearden, —— Ala. ——, 80 Southern 42, p. 44.

DAMAGES EXCESSIVE.

INSTANCES.

A verdict for $30,000 for the death of a tool sharpener employed by an oil well drilling company was excessive. The court ordered a remittitur of all in excess of $20,000 or on failure to make the remittitur a reversal of the case.

Slick Oil Co v. Coffey, —— Okla. ——, 177 Pacific 915, p. 919.

QUARRY OPERATIONS.

CARE EXERCISED BY EMPLOYER—QUESTION OF FACT.

In the operation of a quarry by a cement company, the employees on a signal given were permitted to use a rock house and an oil house as places of refuge. On a signal being given an inexperienced employee with others resorted to the oil house for protection from flying and falling stones. While so waiting a fragment of stone tore through the house and killed the employee. In an action for damages for the death of the employee it was a question of fact for the jury to determine whether the employer exercised reasonable care to provide a safe place for his employees proportionate to the dangerous nature of the means and instrumentalities employed in the business of quarrying stone. Whether the signals and places of refuge provided by the employer were reasonably sufficient and proximate to the place of work, as to afford time within which employees so engaged and about to be imperilled might retreat to such places of refuge and whether such places were reasonably sufficient to afford protection to the employees, were questions of fact for the jury to determine.

Coosa Portland Cement Co. v. Crankfield, —— Ala. ——, 80 Southern 451, p. 453.

INTERSTATE COMMERCE.

TRANSPORTATION OF NATURAL GAS—STATE REGULATION.

The transportation of natural gas through pipe lines from one State to another is interstate commerce, and a natural gas company or its receiver may sell and deliver gas so transported to local distributing companies free from unreasonable interference by a State.

Public Utilities Commission of Kansas v. Landon, —— U. S. ——, 39 Supreme Ct. Rep. 389.

TRANSPORTATION OF NATURAL GAS—REGULATION AT POINT OF CONSUMPTION.

The transportation of natural gas through pipe lines from one State to another is interstate commerce, but the sale and delivery of the gas by distributing companies to their customers after purchase from a producing and transporting company constitutes no part of interstate commerce.

Public Utilities Commission of Kansas v. Landon, —— U. S. ——, 39 Supreme Ct. Rep. 389.

NATURAL GAS—PURCHASE AND DISTRIBUTION BY LOCAL COMPANIES—REGULATION.

Local distributing natural gas companies purchased and received their supplies of gas that had moved in interstate commerce and sold and disposed of the same at retail in due course of their own local business. The fact that the local companies paid to the producing and transporting company sums amounting to two-thirds of the product of their sales did not make them integral parts of the interstate business, especially where the producing and transporting company lacked authority to engage by agent or otherwise in the retail transactions carried on by the local companies.

Public Utilities Commission of Kansas v. Landon, —— U. S. ——, 39 Supreme Ct. Rep. 389.

TRANSPORTATION OF OIL AND GAS.

The transportation of oil or gas from State to State through the medium of pipe lines is interstate commerce.

Pennsylvania Gas Co., In re, —— New York ——, 122 Northeastern 260, p. 261.

Public Utilities Commission of Kansas v. Landon, —— U. S. ——, 39 Supreme Ct. Rep. 389.

CARRIER'S DUTY TO FURNISH CARS—JURISDICTION OF COURTS.

The courts have jurisdiction to administer a remedy in an action by a shipper for a carrier's refusal to accept proper shipments or to supply reasonably adequate facilities of carriage.

Chicago, etc., R. Co. v. Lawton Refining Co., 253 Federal 705, p. 707.

CARRIERS—DUTY TO RECEIVE AND CARRY SHIPMENTS.

There is a general duty resting upon common carriers to receive and carry by suitable means goods which they assume to transport or which are usually carried. This obligation requires that special kinds of cars be supplied for the transportation of goods which the carrier has accepted or which it holds itself out to carry.

Chicago, etc., R. Co. v. Lawton Refining Co., 253 Federal 705, p. 707.

CARRIER—DUTY TO FURNISH TANK CARS.

There are limitations to a carrier's duty to accept goods growing out of the usual course of business and the limitations of convenience. If a shipper wishes to compel a carrier to accept his goods he must properly prepare and pack his product to suit the cars that the carrier assumes to supply and which are ordinarily furnished by carriers for such products. It is not the usual practice of railway companies to furnish tank cars for shippers of oil. A railway company may publish a tariff announcing its readiness to transport oil in tank cars without obligating itself to furnish such cars for the particular purpose. A tank car is not only a car but a package for the goods. There is an economic waste in the use of tank cars because such cars usually are returned empty from where their contents are discharged to the point of the origin of the shipment and they are not adapted for general use. Even under the rules of exchange of cars a railway company may have a large supply of tank cars and yet have none immediately available for its own lines. As a rule carriers have never furnished such cars and it has come to be mutually understood that they shall not do so. The oil refiner like the meat packer demands an adequate supply of cars at all times, but neither an adequate supply nor their efficient distribution can be afforded by carriers.

Chicago, etc., R. Co. v. Lawton Refining Co., 253 Federal 705, p. 708.

CARRIER—RIGHT TO WITHDRAW TANK CARS FOR GENERAL USE.

A railway company published a tariff announcing its readiness to transport oil in tank cars, but the tariff did not purport that the carrier would furnish cars for such purposes and it did not hold itself out as ready to furnish tank cars for shipments. The company had leased five tank cars for its own use in operating its railway and these had been temporarily furnished for the use of a refining company until the railway company should again have need for them. When a prolonged drought endangered its water supply it was the right of the railway company to withdraw these cars from the use of the refining company in order to supply its engines and roundhouses with water. It owed a duty to the public to keep its trains in operation and this duty was superior to the demand of the refining company for the use of the particular tank cars. Under such circumstances the refining company could not compel the railway company to furnish the particular tank cars for shipment of its refined petroleum.

Chicago, etc., R. Co. v. Lawton Refining Co., 253 Federal 705, p. 709.

TRANSPORTATION OF COAL—FREIGHT CHARGES—CARRIER'S POWER TO RELEASE.

The Act of Congress of 1887 (24 U. S. Stats. 739) controls as to the liability for transportation charges of coal and a carrier has no right to release the consignor from liability to pay the freight charges on an interstate shipment and can not by any act estop itself from accepting the lawful freight rate.

New York Central R. Co. v. Philadelphia & Reading Coal & Iron Co., —— Ill. ——, 121 Northeastern 581.

INSPECTION OF OIL IN TRANSIT—FEES.

A State statute may provide for an inspection of oil and gasoline in tank cars and may fix fees for the inspection notwithstanding the oil and gasoline was moving in interstate commerce.

Pure Oil Co. v. State of Minnesota, 39 Supreme Ct. Rep. 35, p. 37.

EXPLOSIVES.

STORING—DEGREE OF CARE EXERCISED—QUESTION OF FACT.

A railroad company had in its possession and gathered together on its pier 38 cars of not less than 60,000 pounds of an explosive known as T N T. An explosion was caused by fire that started at or near the ammunition cars. This vast quantity of explosives was stored in proximity to the habitations and businesses of millions of human beings whose lives and properties were thereby exposed to the risk of unusual danger. Whether the railroad company had exercised that degree of care commensurate with the risk or danger arising from the accumulation of the vast quantity of high explosives upon its premises in cars standing in close proximity to each other was a question of fact for a jury.

New Jersey Fidelity & Plate Glass Ins. Co. v. Lehigh Valley R. Co., —— N. J. Equity ——, 105 Atlantic 206, p. 207.

STORING LARGE QUANTITIES OF T N T.

The Lehigh Valley Railroad Company was held liable in damages to an insurance company for sums paid by it for glass broken and damaged by the terrific explosion that occurred on the morning of July —, 1916, at the Jersey dock of the railroad company where it had large quantities of the explosive known as T N T stored and several freight cars standing near-by loaded with the dangerous explosive. The defendant's liability for damages was not based upon the violation of the interstate commerce commission's regulations in regard to the shipment and storage of explosives, but was based on negligence in the transportation of explosives in that it failed to exercise care commensurate with the risk of danger.

New Jersey Fidelity & Plate Glass Ins. Co. v. Lehigh Valley R. Co., —— N. J. Equity ——, 105 Atlantic 206, p. 208.

GASOLINE—LIABILITY FOR FIRE.

An oil company engaged in the business of selling gasoline is not liable on the grounds of negligence where its agents rolled a barrel of gasoline down a street to the complainant's buildings, and where the barrel was then opened in the usual way for the purpose of emptying it into a tank and while so emptying the barrel, the gasoline became ignited and the fire extended to and burned the complainant's buildings.

O'Brecht v. Cedar Rapids Oil Co., —— Iowa ——, 170 Northwestern 785, p. 786.
See Carter v. Marshall Oil Co., —— Iowa ——, 170 Northwestern 798.

STORAGE OF OIL AND GASOLINE—VALIDITY OF ORDINANCE.

An ordinance of the city of Santa Fe attempting to regulate the storage and selling, handling and distributing of petroleum and gasoline was so vague and uncertain as to be wholly inoperative and the omissions were such that a court could not complete or make certain the otherwise incomplete and uncertain ordinance.

Continental Oil Co. v. City of Santa Fe, —— N. Mex. ——, 177 Pacific 742, p. 744.

EXPLOSION OF GASOLINE FUMES—LIABILITY FOR DEATH OF EMPLOYEE.

An oil company was liable where it negligently failed to remove the fumes from a gasoline tank before sending an employee into the tank to make certain repairs, and where while the employee was engaged in his work he accidentally broke an electric lamp thereby causing an explosion of the gasoline fumes resulting in his death.

Standard Oil Co. v. Allen, —— Ind. App. ——, 121 Northeastern 329, p. 332.

REGULATION OF GASOLINE FILLING STATIONS.

A city permitted an oil company to establish and conduct a gasoline filling station at and near the intersection of certain streets. Subsequently the conduct of the gasoline filling station became a menace to pedestrians and a nuisance to street traffic by reason of the dangers growing out of the handling of the gasoline. The fact that the city originally authorized the location of such gasoline station would not estop the city to abate it when it became a nuisance or a meance to pedestrians.

Oriental Oil Co. v. City of San Antonio, —— Tex. Civ. App. ——, 208 Southwestern 177, p. 181.

ORIGINAL VENDOR OF EXPLOSIVES—LIABILITY.

When a vendor sells to a vendee who in turn sells to another a dangerous article or an article inherently dangerous and harmful, such as gasoline, for the ultimate purpose of retailing to the public, a purchaser of such dangerous article who may be injured has the right to claim that the original vendor owed him a duty, the violation of which would create liability.

Kearse v. Seyb, —— Mo. App. ——, 209 Southwestern 635, p. 636.
See Pierce Oil Co. v. Deselmns, 212 U. S. 159, p. 177.
  Standard Oil Co. v. Parrish, 145 Federal 829.
  Stowell v. Standard Oil Co., 139 Mich. 18, 25, 102 Northwestern 227.

NEGLIGENCE OF VICE PRINCIPAL—LIABILITY OF EMPLOYER.

An employer is liable for an injury to an employee caused by the bursting of a barrel through the negligence of a vice principal of the employer who inserted a lighted match into the barrel to ascertain the amount of liquid remaining and thereby caused the explosion.

Coca Cola Co. v. Williams, —— Tex. Com. App. ——, 209 Southwestern 396, p. 397.

DYNAMITE—CONDITIONS FOR USE—AGREEMENT BETWEEN OPERATOR AND MINER—RULES APPROVED BY MINE INSPECTOR.

The statute of Kansas (General Statutes, 1915, section 6326) prohibits the use of dynamite or other detonating explosives in shot firing in coal mines except under rules and regulations agreed upon between the operator and the miners and approved by the State mine inspector. A contract of employment between a mine operator and a miner provided that the management of the mine, the direction of the working force, and the right to hire and discharge are vested in the operator, and that any mine committee that shall attempt to execute any local rule in conflict with this agreement shall be deposed as committeemen. This agreement does not satisfy the statute and does not of itself constitute "rules and regulations for the use of dynamite" and was not approved by the State mine inspector.

Richards v. Fleming Coal Co., —— Kans. ——, 179 Pacific 380, p. 382.

STORING DANGEROUS OILS—STATE REGULATIONS.

A State may by statute prohibit the sale of dangerous oils though manufactured under a patent, and it may make the place where they are kept or sold a criminal nuisance and may prohibit the storing of petroleum and gasoline in certain designated quantities within 300 feet of a dwelling in a city.

Pierce Oil Corp. v. City of Hope, 39 Supreme Ct. Rep. 172.
See Pierce Oil Corp. v. City of Hope, 127 Ark. 38, 191 Southwestern 405.

JUDICIAL NOTICE OF EXPLOSIONS.

Courts take judicial notice that disastrous explosions have occurred for which no satisfactory explanations have been given.

Pierce Oil Corp. v. City of Hope, 39 Supreme Ct. Rep. 172, p. 173.
See Pierce Oil Corp. v. City of Hope, 127 Ark. 38, 191 Southwestern 405.

WATER RIGHTS.

APPROPRIATION FOR MINING PURPOSES—EXTENT.

The right to appropriate water for mining and other beneficial purposes under the Arizona statute (par. 5344, R. S. A. 1913) is not limited to rivers, creeks, and streams of running water on State and privately owned lands, but extends to public lands by grant of Congress under section 2339, R. S. 1878.

McKenzie v. Moore, —— Ariz. ——, 176 Pacific 568, p. 569.
See Peterson v. Eureka Hill Min. Co., —— Utah ——, 176 Pacific 729, p. 730.

MANNER AND PURPOSES OF APPROPRIATION.

The manner of appropriating water on the public domain is delegated to the States, and in Arizona the right to appropriate water for any beneficial purpose and thereby acquire a vested right in the water is limited to the appropriation of the waters of "rivers, creeks, and streams of running water in this State."

McKenzie v. Moore, —— Ariz. ——, 176 Pacific 568, p. 569.
See Peterson v. Eureka Hill Min. Co., —— Utah ——, 176 Pacific 729, p. 730.

WATERS SUBJECT TO APPROPRIATION.

Before a party giving notice as provided by the statute of Arizona can acquire any water right thereof, his claimed appropriation must be of waters of a river, creek, or stream of running water. Congress by section 2339 (R. S. 1878) has reserved all waters on the public lands other than the waters of rivers, creeks, and running streams from appropriation by anyone separately from the land.

McKenzie v. Moore, —— Ariz. ——, 176 Pacific 568, p. 569.

RIGHT TO APPROPRIATE PERCOLATING WATER.

Percolating water unconfined to a definite channel is not under the statute of Arizona the subject of appropriation, but belongs to the realty. A spring which does not constitute the source of a watercourse, the flow of its water being subterranean and concealed and a matter of uncertainty as to direction and volume, belongs to the owner of the land who may appropriate and use its entire flow.

McKenzie v. Moore, —— Ariz. ——, 176 Pacific 568, p. 569.
See Peterson v. Eureka Hill Min. Co., —— Utah ——, 176 Pacific 730.

ATTEMPTED APPROPRIATION.

A person can not appropriate the waters of a spring by posting a notice which failed to show that the notice was posted at a spring or at a point from the spring on a stream having its source at the spring; but where the inference is that the notice was posted at a spring which was not the source of a stream but simply a seeping spring or well, there can be no appropriation. By the attempted appropriation the person acquired no right whatever in the water nor in the land by reason of his notice so posted or work done pursuant thereto.

McKenzie v. Moore, —— Ariz. ——, 176 Pacific 568, p. 569.

SPRING WATER—RIGHT TO APPROPRIATE.

The waters from a spring rising on lands that have been segregated from the public domain and the title vested in private ownership can not be appropriated by a person other than the owner of the land, unless the water from the spring should flow below the tract of land on which it is located.

Peterson v. Eureka Hill Min. Co., —— Utah ——, 176 Pacific 729, p. 731.

APPROPRIATION OF SPRINGS—RIGHT TO USE FOR MINING PURPOSES.

A mining corporation in 1881 appropriated all the water flowing from a spring by building a pipe line and conducting the water from the spring through its pipe line to its mine and used the same in mining operations. In 1885 the mining company, to increase the flow of water, dug a tunnel from the spring into the mountain nearly 200 feet, and all the water flowing from the tunnel and from the spring was collected and conducted to the defendant's mine and used for mining purposes. About the year 1900 the pipe line was broken and for several years the water was leased by the mining company to other persons for beneficial purposes. In 1904 certain persons located a placer claim, and the spring of water and the tunnel as constructed were wholly within the limits of such placer mining claim. Under these facts, the locator of the placer mining claim was not entitled to the waters of the spring and could not as against the mining company appropriate and use the water from such spring and tunnel.

Peterson v. Eureka Hill Min. Co., —— Utah ——, 176 Pacific 729, p. 730.

SPRINGS—BENEFICIAL USE—SECOND APPROPRIATION.

A mining company has the right to appropriate the waters of a spring and apply them to a beneficial use where the soil upon which the spring was located was a part of the public domain; and a third person can not locate a mining claim so as to include within its limits such spring and claim the right to appropriate and use the water from such spring.

Peterson v. Eureka Hill Min. Co., —— Utah ——, 176 Pacific 729, p. 730.

WATER RIGHTS PROTECTED.

A man residing upon public land and relying upon natural spring water for use ought not, after developing the flow of the spring and piping the flow to a reservoir for watering stock and for domestic use of a tenant living in a house near the spring, to be deprived of the water or the water and improvements by one who has no better title to the land than the person first using the water.

McKenzie v. Moore, —— Ariz. ——, 176 Pacific 568, p. 570.
See Peterson v. Eureka Hill Min. Co., —— Utah ——, 176 Pacific 729, p. 730.

PUBLICATIONS RELATING TO MINING LAWS.

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DEPARTMENT OF THE INTERIOR
JOHN BARTON PAYNE, SECRETARY
BUREAU OF MINES
FREDERICK G. COTTRELL, DIRECTOR

CASING TROUBLES AND FISHING METHODS IN OIL WELLS

BY

THOMAS CURTIN

WASHINGTON
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CASING TROUBLES AND FISHING METHODS.

By Thomas Curtin.

INTRODUCTION.

The Bureau of Mines, in its researches aimed to prevent wastes and to increase efficiency in oil-well practice, has investigated the matter of casing troubles and fishing methods. The results of the investigation are set forth in this paper.

After expensive development work, many wells being drilled for oil have been abandoned because of casing troubles. These troubles in many instances have been thought to be insurmountable, whereas they are sometimes susceptible of solution. In fields where casing difficulties are of daily occurrence, methods have been evolved for combating them. Were these methods more widely known and applied wherever the same conditions exist, the oil industry at large would be greatly benefited. This report attempts to classify these troubles and suggests solutions that will save the operator discouragement and expense.

It is assumed throughout this paper that the reader is so familiar with the ordinary oil-well drilling and fishing methods that detailed explanation is unnecessary. The well-drilling terms that are used herein will be readily understood by those for whom this discussion is intended. However, in order to avoid confusion as to the sense in which some of these terms are applied, definitions are included.

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DISCUSSION OF "MOTION" IN DRILLING WITH DRY AND WET HOLES.

As success in "fishing" primarily depends upon a proper knowledge of tool running, and as tool dressers because of the greater need of drillers are now promoted to drillers more quickly than formerly, the following hints on the running of tools may be of service to many drillers, although it is acknowledged that the skill necessary for efficiency can be gained only through practice.

"Motion" is the engine control applied by the driller in the raising and dropping of cable tools. A driller who thoroughly understands motion has mastered his trade so far as the operation of the drilling tools is concerned.

With each added foot of hole there is an almost unnoticeable change in motion. As the depth of the hole increases, the difference in motion becomes evident when compared with the motion carried at a shallow depth. The adjustment of the steam power to the fall of the tools changes with every variation of the hole.

When drilling in a dry hole, with a manila line, control of the tools becomes more difficult as the depth increases; the engine becomes "weaker" with the greater load caused by the increased depth of hole.

As a premature use of engine balances retards the drop of the tools and compels a slower motion, the common practice among experienced drillers is to avoid the use of the balance in dry-hole, manila-line work where the formation stands up, so long as they can keep the engine "on its feet" without being compelled to run the tools too "loose." With an ordinary drilling engine, when a depth of 2,000 to 2,500 feet is reached without the use of a balance, great skill in steam control is required to maintain the proper motion, or, in fact, any workable motion.

If the opposing drillers, on different tours or shifts, are not equally skilled in steam control, or, as it is termed, in handling the engine, the sensible procedure for the driller having trouble in maintaining the proper motion is to swallow his pride and resort to the use of the balance when he comes on tour, allowing his mate to take the balance off or leave it on at his discretion.

When an engine begins to become unmanageable, time is saved by putting on a balance, and the danger of compulsory loose running in order to retain engine control is averted.

The same rules that apply to manila-line drilling, as regards motion and balances, do not apply when using a wire line. The "reach" and "take up" of a manila line exceeds that of a wire line. In wire-line drilling, the weight of tools and other conditions being the same, the use of balances at lesser depths than would be required with a manila line is a distinct advantage.

The early use of balances with a wire line is especially recommended where drilling jars are run. The quick snap given the tools on "catching" them before they strike, by an occasional excess of motion difficult to avert, often causes the jars to break. The tendency to catch the tools from an excess of motion with the wire line is greater with a "weak" engine. Besides, when using a wire cable it is necessary for the driller to follow more closely the jar observed at the surface. The lack of stretch in the wire line, if the drilling is "good," requires more constant letting out of the screw.

The "reach" and "take up" of a manila cable makes the striking of bottom possible with such a cable long after the bottom would have "faded" before the stroke of the tools on a wire line. The "reach" of the manila cable is easily described by what the older drillers call "lift." For example, the tools would be running "loose" and permitted to "pound." As the tools "drilled off" and commenced to "reach" a noticeable "lift" could be observed after the jar was received at the surface. This lift would feel much as if the handlebar of the screw had exceeded the usual height, which in reality could not occur. As this lift is a demand for "screw," if screw is withheld there will be a slight pause in the motion, soon followed by the engine's being "off its feet," thus compelling screw.

"Lift" is explained as follows: As the tools begin to "reach" on the downward stroke the cable lets out. When the tools strike, the elasticity in the manila cable causes a "taking up" of stretch at the reaction of the tools. Drillers contend that this "taking up" of cable stretch is in reality what is felt at the surface as lift.

With the wire line, except at great depths, the nearest parallel to the lift of a manila cable in a dry hole is "peg-legging" (alternate hitting and missing of the tools). Tools will peg-leg with the wire line, but should not be permitted to do so in a dry hole under ordinary conditions.

If the motion is normal, when the tools "drill off" they will peg-leg; this is a demand for screw. Peg-legging can also be caused by a lack of motion. If there were more reach to a wire line, the tools would not peg-leg so readily. An excess of motion when tools are peg-legging will result in catching of the tools, with danger of breaking the jars.

Both lift and peg-legging are to a great extent dependent upon depth. Lift is seldom discernible above 500 feet. Tools do not easily peg-leg above 300 feet under correctly applied motion.

Many drillers contend that there is little to the mastery of motion with the wire line. As a rule such men, owing to long experience, regulate the motion automatically. Wire-line drilling, however, requires the same mastery of motion—perhaps more easily acquired—as the manila line.

The most common error of the novice with the wire line is the catching of the tools. This is also a common error of drillers accustomed to using a manila line and to the solid jar of the tools in a formation that stands up, when they change to soft and wet hole drilling in wire-line territory. They often mistake the catching of the tools for the solid jar they seek and to which they are accustomed, with the result that they "jack" the line or break the jars, or, in the event of no accident, fail to make progress until they have fathomed the trouble.

The types of formation that a driller must combat vary so greatly that it is impossible to give hard and fast rules for his guidance. In "mud countries"—on the assumption that a wire line is always used where mud and water are encountered—it is advisable to hold the tools up. Some formations are such that when a distinct jar is noticeable further progress, without bailing, is impossible, as this jar indicates that the tools have started to "load up." With continued running the jarring becomes more noticeable, but the tools are making no headway.

Where sticky blue shale is encountered and the tools tend to stick with every revolution of the engine, keeping the motion as rapid as can be safely carried will be found of assistance. Drilling through a formation of this type is necessarily hard on equipment and timidity becomes a greater fault than boldness.

A false jar often occurs in cleaning out muddy and caving holes. As this jar occurs on the down stroke, it is probably caused by the motion exceeding the drop of the tools for an instant; the tools are momentarily retarded with mud, but regain sufficient velocity to keep pace with the engine. No attention, within reasonable limits, should be paid to such jarring, because if the motion is slowed up to conform to the drop of the tools and the jar thus eliminated, the velocity of the tools is so retarded that they merely slide up and down in the mud and water without doing work. Therefore, it is essential to carry sufficient motion to mix the mud with water and to prevent the tools from loading up.

BRIEF COMPARISON BETWEEN MANILA AND WIRE LINES.

Straining a cable by "pulling" is more destructive to a manila cable than it is to a wire cable. The wire line will stand the heavier pull.

A manila cable "takes up" when idle upon the shaft, or when subjected to dampness, and will stretch when in use. This renders a "marker" on a manila line less dependable than a "marker" on a wire line.

If avoidable, a manila cable should not be used in a "wet" hole.

Manila cables are not so destructive to pipe as are wire cables.

USE OF JARS.

Drilling jars are of short stroke[a] and are run above the stem. They are always used extended in drilling, and their chief purpose is to aid in "switching" tools loose when the tools are stuck. As the weight above that part of the drilling jars which receives the blow, is usually only that of the rope socket and the upper half of the jars, and as the stroke of the jars is only a matter of a few inches—4 to 12 inches, as a rule—a very strong blow can not be expected from their use.

Fishing jars are run on the bottom of the stem. Their usual stroke is 36 or 48 inches, although nearly any length of stroke is obtainable. The force of the blow obtained by the use of fishing jars is governed by hitch, stroke, weight of stem, and motion.

In fishing where "jarring" is expected the engine should be balanced except at very shallow depths. This will insure the engine having enough driving power to do its work under any sudden increase of load. In "jarring up," a "weak" engine results in the belt slipping or being thrown when the beam "turns over" before the "hitch" has been regulated by the screw.

A stem of suitable size and weight for the work expected should be provided, and special attention should be given to the pins and boxes of all tools. The wrist-pin adjustment in the crank shaft should be changed to conform with the stroke of the jars and the length of blow desired. Let it now be assumed that the fishing tool has taken hold of a stationary object at the bottom of the hole and that it is desired to jar up. The "hitch" is obtained by raising the tools with the bull ropes until the jars strike up. Then a hitchstring is tied to the cable at a point even with the top of the hole; the tools are backed slowly down the hole a few feet; the engine is reversed, and the tools started quickly upward. When the string appears at the surface, the bull ropes are thrown. A few inches of slack is then run into the hole, care being taken not to run in enough slack to permit the jars to strike downward upon the "turnover" of the beam after clamping on; then clamp on, "rock" the engine to ascertain whether enough slack has been provided to prevent too great a line tension on the rig, regulate the "hitch" with the screw satisfactorily, and start the beam to turning over. The screw is regulated until the "jar" received at the surface is satisfactory; from then on the force of the blow is governed by regulating the motion of the engine.

To "drive" or jar down, follow the same procedure as in jarring up, with the following exceptions: In taking the "hitch," ascertain at what point the jars strike down, instead of up; tie a string onto the cable when it is even with the top of the hole when the "down" contact of the jars is received; then clamp on at this point.

---

[a] For definition of jar stroke see p. 7.

In driving down if the hitch has been judged accurately, the "jar" will be received at the surface almost simultaneously with the impact of the jars at the bottom of the hole. If after the "jar" is received at the surface the driller observes that several inches of cable travel into the hole before the down stroke is completed, he can judge that the hitch is as about an equal distance "loose."

USE OF POWER.

The driving and jarring power of a string of tools is tremendous and always sufficient, if applied to the limit, to obtain results of either a satisfactory or an unsatisfactory nature. The driller, therefore, should use discretion in controlling this power. So far as possible, only enough power should be applied to achieve in the safest way the results he desires. The possibility of hidden imperfections in all drilling equipment adds a degree of uncertainty to the most cautious efforts, and often success seems assured when an unnecessary application of power—caused by a natural impatience if progress is slow—will strain a tool beyond its strength and cause it to break.

STRINGING OF CASING BLOCKS.

There are several methods of stringing blocks for handling long strings of casing. The method most generally approved is shown in figure 1. This method, it will be noted, is for the use of seven lines, but if only five lines are desired, pulleys 3 and 6 may be left unstrung, thus giving five lines.

A common error in stringing casing blocks is to bring the line direct from the calf-wheel shaft to the initial pulley without the reversal noted in *a* and *b* over pulley 1. Without the reversal, the blocks are not in alignment with the hole, and the "starting" of pipe is made difficult. This causes a loss of time in handling casing and may even result in a joint of pipe being screwed in cross threaded, with the inevitable result—a parted string of casing.

SIZE AND WEIGHT OF CASING.

All casing used should conform in size and weight to the requirements of the work anticipated. It is better to err on the side of safety and provide pipe of slightly greater weight than deemed necessary than to take the chances of collapsed pipe and the possible loss of a hole.

Many holes are "run down to a point." By this is meant that the size of the pipe has been so reduced through necessity that when the well is finished the diameter of the hole is insufficient for practical purposes.

Skilled operators endeavor tó start a hole of such large diameter that compulsory landing of the casing at shallower depths than was expected will not necessitate reducing the diameter so rapidly that when the hole is finished it will be too small to meet the needs adequately. This precaution is on the side of safety, because in such a hole the unexpected insertion of smaller casing does not unduly reduce the diameter—the hole being of sufficient diameter when started to discount any reduction in size.

CASING THREADS.

Many lease superintendents who struggled through the years when eight threads to the inch on casing for drilling purposes was the popular demand, are surprised that this old mistake continues to be common in many sections of the country to-day. It may be said without qualification that pipe having eight threads to the inch is not suited to work requiring long and heavy strings of casing.

Adequate tests and comparisons long ago eliminated 8-thread pipe from practical consideration for use in territory where it must endure severe stress. The superiority of 10-thread pipe has been demonstrated so conclusively that very little 8-thread pipe will now be found, even where it was at one time the more popular. Usage has demonstrated that the 8-thread pipe lacks strength, owing to the deeper cut required for the thread. It was found that the pipe often broke in the thread when subjected to strain. Besides, the 10-thread pipe proved more consistently water-tight and less liable to admit particles of sand and grit, which would bind the thread and destroy it in unscrewing.

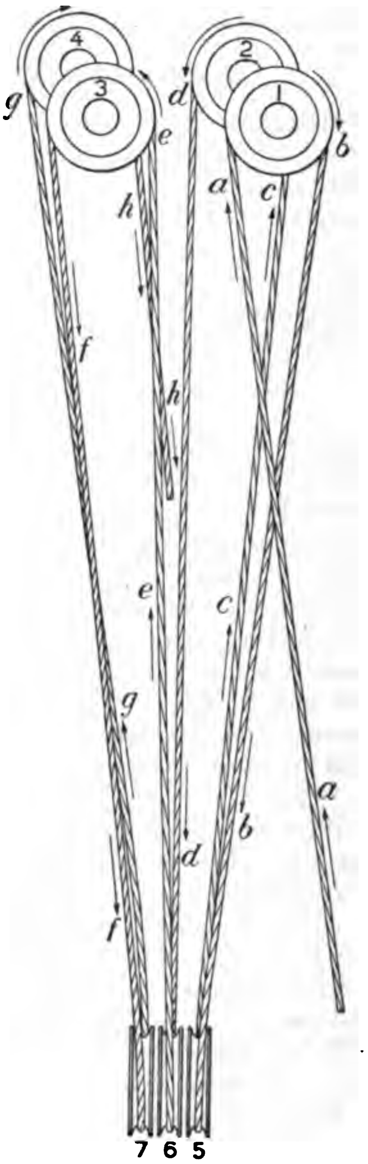


FIGURE 1.—Method of stringing casing blocks for the use of seven lines.

Hence it is demonstrated that only in exceptional circumstances can 8-thread pipe be used to advantage in cable-tool drilling, or perhaps in places where the small amount of pipe required makes the size of the thread unworthy of much consideration.

STRETCHING OF CASING AFTER LANDING.

After a string of pipe is landed the pipe should be lifted and the weight supported at the top on a set of clamps. The object in doing this is to relieve the weight on the lower joints and take up the "stretch," so that the pipe will hang taut and rigid in the hole, care being taken not to pull the shoe off the shoulder upon which it is landed. To neglect this precaution is to place the pipe in danger of being injured by tools coming in contact with the different sections of the pipe that are slightly bowed from the weight of the pipe above.

"COLLAR-BOUND" PIPE.

Pipe sometimes becomes "collar bound" in a hole. In such an event the pipe can be worked for about the length of a single joint, or about 15 or 20 feet, but will not pull above a certain point. This is caused by mud loading heavily upon the collars and by a mud-laden collar—usually the bottom one—coming in contact with a tight place in the hole. The condition may be aggravated by sand filtering in and finding a resting place upon the mud-laden collar. In such cases it is necessary to keep the pipe in constant movement until it will pull freely past the point of obstruction and pass easily down through the same place; otherwise, such a condition is almost certain to cause the pipe to "freeze" rapidly. (See "Frozen pipe," p. 15.)

When pipe is collar bound, too powerful an effort to pull it through the tight place in the hole will often cause it to become lodged, so that it will neither pull nor fall back to the bottom. This condition should, if possible, be averted by the exercise of patience in working the pipe. Usually collar-bound pipe, if worked patiently up and down in the hole—the collar being pulled gently into the tight place, and the engine then reversed before the pipe has become lodged—will clear itself sufficiently of the sand and mud gathered upon the collars to permit free movement.

When collar-bound pipe "lodges up the hole," the pipe must, of course, be driven back in order that it may be moved again and to prevent its rapid freezing. As a rule, the slightest tap with the tools and drive clamps is enough for this purpose. Unless great care is exercised in control of the pipe, it may be injured in dropping, because pipe thus lodged drops with tremendous force under the impetus of its own weight when once started. Therefore a free drop of even a few inches may result in serious damage, if the pipe strikes bottom or if a collar strikes an elevator sitting upon an ordinary spider, or any similar accident happens.

FROZEN PIPE.

The expression "frozen pipe" is applied to casing rendered immovable in a hole by cavings—sand, limestone cuttings, and other gritty substances—settling around the outside of the casing. Casing may be landed without danger of freezing through pure shale mud or in an unbroken shale formation. Shale mud is used as an agency to wall off sands and hold back caving formations, both in the rotary drilling method and in the circulator system with cable tools.

MUDDING TO PREVENT FREEZING.

The rotary drilling method is by far the best method we now have for mudding off caving sands and shales. Open hole is readily drilled with a rotary rig in such places as will admit of the use of this equipment, and a saving of valuable pipe ensues because the wall of the hole is compelled to remain in place. The wall is actually plastered in place with shale mud. The circulator system with the use of cable tools has a similar effect, but the pipe must be carried in the drilling, and sometimes will freeze very rapidly even with the shale mud constantly circulating down the inside and up the outside of the casing. This freezing would probably be less frequent were the circulator system as thorough in mudding wells as is the rotary method; but it is not and sand filters into the hole.

STRESS ON PIPE IN PULLING.

The "stretch" of a string of casing is a much-discussed subject. Some maintain that a string of pipe of a given size, when pulled upon, will stretch 1 inch to the 100 feet without parting. Many drillers, when pulling upon a frozen string of 8-inch pipe, insist upon obtaining this amount of stretch. This is a dangerous practice and is often the cause of parted casing. There is no set rule as regards a safety margin of stretch for any given size of pipe, even when the "friction" is known and the general condition of the pipe is assumed to be the best. The problem is wholly dependent upon the judgment of the driller, and even the best judgment is subject to error because of possible flaws in the equipment.

The dangers incident to pulling on frozen pipe are well known. In case it is necessary to resort to pulling upon pipe in this condition, it should be done from the engine house, as it is not unusual for the derrick to be "pulled in," or for the pipe to part near the surface, throwing slack in the calf line. Many men have been injured by the derrick pulling in, and many others by being caught in the slack thrown near the calf-wheel shaft when the pipe parted.

KEEPING CASING FREE.

In some districts of this country, principally in California, casing freezes with astonishing rapidity. In the Coalinga (California) field it was not an unusual occurrence for pipe to freeze firmly in 15 minutes, and perhaps be forever lost. To keep the pipe free, various methods were applied, but none was successful in cable-tool drilling, although equipment was introduced that aided in moving the pipe.

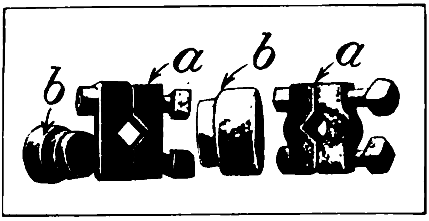
It was extremely difficult to move the pipe every few minutes in order that it might be kept from freezing, and drilling was greatly retarded by the necessity of unhitching and moving the casing. The circulator system of drilling was used with questionable results; the pipe was timed by watch so that it might be permitted to stand as long as possible, until the danger of freezing was actually acute, in order that drilling could proceed more regularly. However a heavy loss of pipe and a rapid reduction of the diameter of the hole continued for years.

It has been observed that after the wall of a hole has become saturated with oil the pipe is less liable to freeze and oil sand is not nearly so prone to freeze pipe as are dry or water sands.

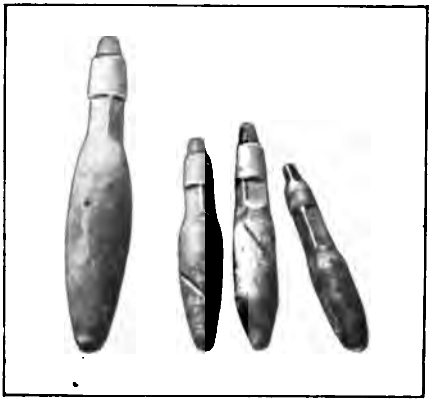
At a well belonging to the Amalgamated Oil Co., of California, the drilling foreman, Thomas N. Kellett, issued instructions that the well be circulated with oil in the hope or relieving a string of casing which tended to freeze so rapidly that it had to be kept in constant motion to permit further progress. The experiment proved very successful, relieving the tendency to freeze so much that the pipe would stand safely for hours.

Quite the reverse was the experience of the drilling foreman, H. A. Winger, of the Shell Oil Co., of California, who was confronted with the problem of continuing work on a well that was in the oil sand and for this reason was not expected to freeze pipe readily, but, nevertheless, showed a decided tendency to do so. The pipe would not stand more than 15 minutes without freezing firmly, and more often 7 minutes rather than 15 was the margin of safety. It was decided to pull the casing and put a screen pipe on the bottom joint. After this was done, the pipe was rendered free enough to permit two to three hours to elapse without moving it.

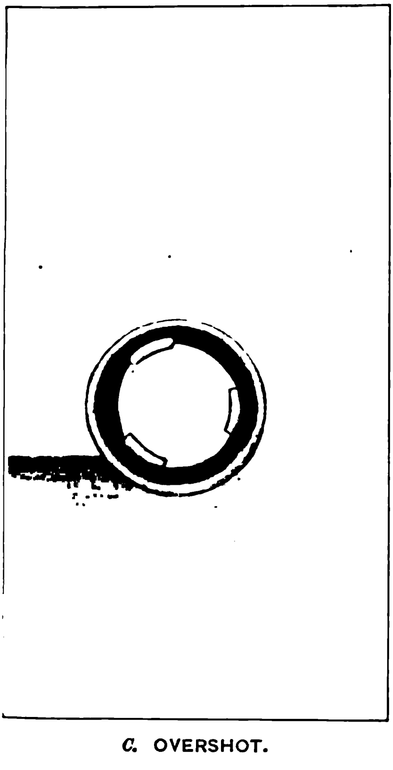
From the above illustrations it can be seen that the action of freezing pipe is very erratic and that oil may fail as a means of relief for freezing. However, in territories where the formation is very similar to that in California and where oil is encountered in small quantities at shallow depths, as in parts of Wyoming, Mexico, and Burmah, usually pipe will stand many months without the slightest tendency to freeze.



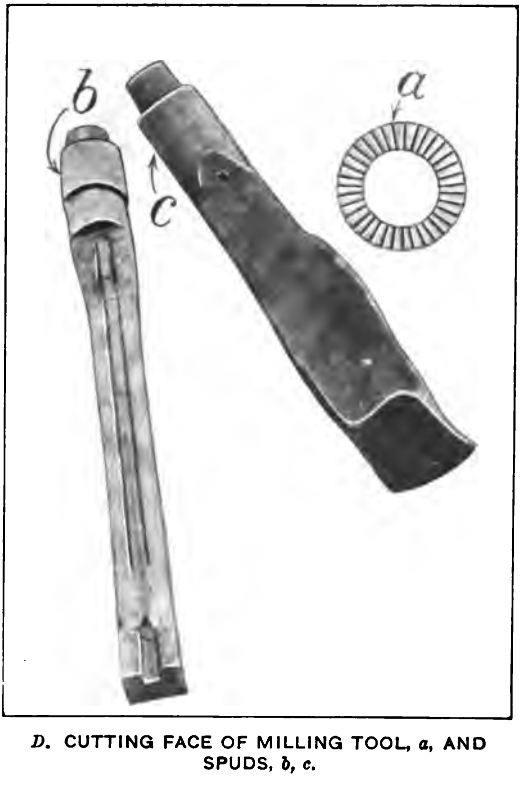
A. DRIVE HEADS AND DRIVE CLAMPS.



B. SWAGES.



C. OVERSHOT.



D. CUTTING FACE OF MILLING TOOL, *a*, AND SPUDS, *b, c*.

USE OF SWINGING SPIDER.

The swinging spider (fig. 2, p. 18) is probably one of the most useful inventions introduced in recent years for the handling of casing in drilling oil wells. The walking beam and screw operate between the reins of the spider, absolutely without hindrance, and the pipe may be lowered at will by merely raising the calf-wheel brake without in any way interfering with drilling.

Should it be necessary for any reason to drive the pipe, it can be done safely with the use of this spider, as the spider does not contain teeth slips when in ordinary use, but is fitted with lugs that fit snugly beneath the pipe collar and permit the spider to move freely up and down the pipe. (See fig. 2.) In long strings of casing or when it was necessary to do any severe pulling, it has been found expedient to use teeth slips and catch the top joint of pipe below the coupling to avoid accidents resulting from pulling off the coupling.

When drilling is in progress, as formerly stated, the pipe is suspended upon the casing blocks and is governed by the calf wheels, being permitted to slip a few inches, without even checking the drilling motion, whenever the driller desires to move the pipe.

In driving, the spider can be permitted to slip down the pipe a few inches; then, if the pipe is driven free and drops with any great velocity, it will be caught by the spider, and all danger of abrupt stopping will be eliminated by the spring of the lines and derrick. For such work the swinging spider is used in conjunction with an ordinary spider. The smaller spider rests upon blocks in the collar and is used only to hold the pipe when the swinging spider is removed for the purpose of inserting a joint, or for any similar purpose. The spider shown in figure 2 is in use by the Shell Co. of California, but is only one of several types that have been introduced.

DRIVING PIPE AT TOP OR SURFACE.

The best plan, where frequent driving is expected, is to keep a drivehead in continual use in order to protect the threads of the top coupling from the wear of the cable, and also to avoid unnecessary breaking of tool joints—to pass the tools through the drivehead—when time is an important factor. The ordinary drilling tools may be used for this operation. The method is almost universally understood among operators, and is similar to the spudding method used in starting a hole, with the exception that strong drive clamps (see *a*, in Pl. I, *A*), are firmly fastened on the wrench grip at the top of the stem, and a drivehead, *b*, is inserted in the pipe coupling to protect it from the blow of the clamps when the tools drop.

Driving is resorted to when it is desired to force a string of pipe down to obtain a seat, as in cementing, and in other work where pull-

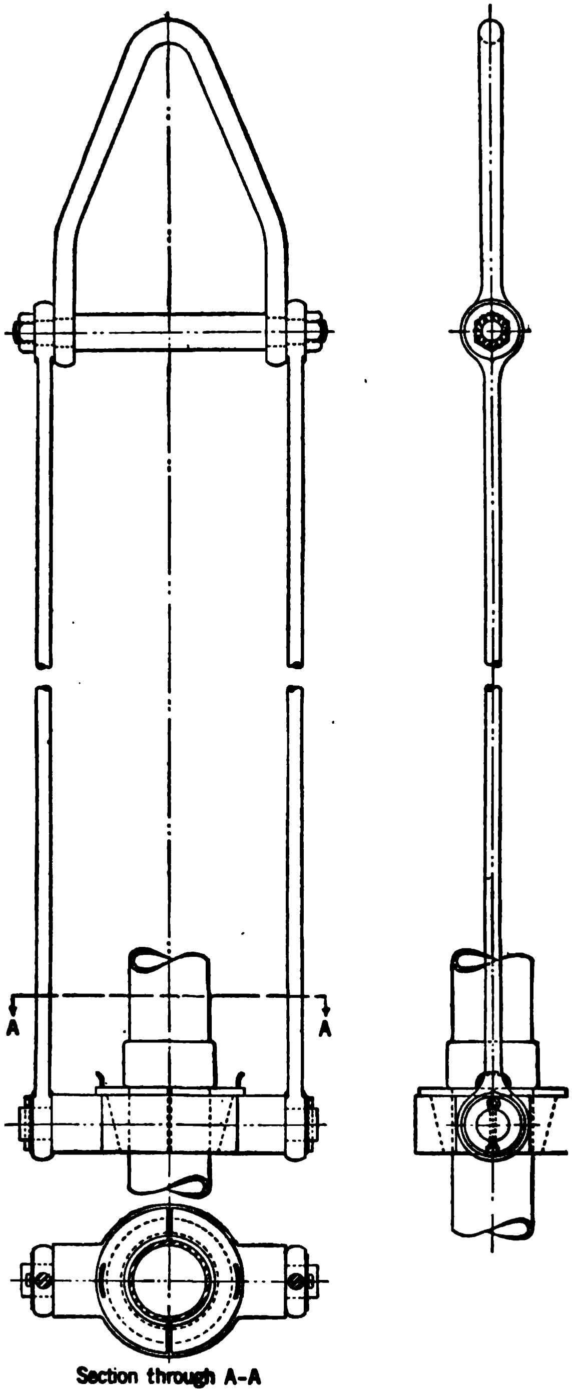


FIGURE 2.—Swinging spider.

ing the pipe up and underreaming has proved detrimental, but there is still reason to believe that the pipe can be landed at a greater depth without injury by driving. The following discussion, however, deals only with driving as a means of loosening frozen pipe.

Drive pipe has been manufactured for many years, but is seldom used. Drive pipe differs from the pipe in ordinary use in that it "shoulders" in the couplings—that is, the thread end of a joint may be screwed into the coupling of another joint until the ends of the two joints butt against each other, with no space between. The use of this pipe is so exceptional that all further references herein are confined to the pipe in ordinary use.

In driving pipe at the surface of the ground, the chief consideration should be the weight per foot of the casing, and the next consideration should be the length of the string of casing. Driving pipe at the surface is now generally confined to strings of medium length. The jar-down spear (fig. 3) is used for the longer and heavier strings of pipe. In surface driving, the string of tools should be stripped below the stem of any fishing tools or jars. No injury results if a bit, or similar tool, is left on the stem, but a set of jars hanging loosely on the stem, or even weighted with a tool, are very liable, if not almost certain to "jump a pin" and drop to the bottom of the hole. In driving to loosen a string of frozen pipe, the procedure is as follows:

With jars at the top of the stem and no tools other than a bit on the bottom of the stem, the tools are run through a drivehead in the coupling of the casing, and a set of drive clamps is fastened upon the square part of the stem at the top. A "jerk line," as in spudding, is then run from the wrist pin of the crank shaft to the slack line run from the bull-wheel shaft, and the two are fastened with a spudding shoe and hook. With the bull rope off, the bull wheels are turned by hand to take up the slack in the cable, care being taken to protect the coils on the shaft from injury by "crowding." After the slack is taken up, the bull-wheel brake is tied down, and the engine is started. The tools now rise and fall with the revolution of the crank shaft, and drop with great force upon the drivehead in the coupling. The pipe will give several inches under the force of the blow, depending upon the length of the string and the point at which frozen, and will spring back with great rapidity. The pipe should be carefully marked. If it drives readily as much as 1 inch, this is a very encour-

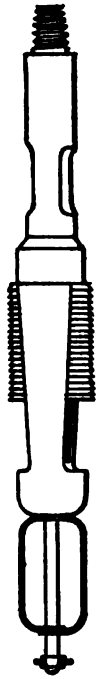


FIGURE 3.—Drive-down spear. When tripped, the slips grip the pipe, stopping further descent of the tools. This spear pulls out readily.

aging sign. If after continued driving no progress has been made, resort must be had to some other method in order to loosen the pipe; but if the pipe drives, it is well to pull the pipe back the length of the distance driven, or a greater distance if this can be done safely. The pipe should then be driven down again.

Movement is the object sought. As a rule, when the pipe will drive 1 or 2 inches readily, it will pull back an equal distance, or slightly more. If the pipe is then driven again, upon the second pull the distance will usually increase slightly. This procedure should be continued until the pipe will work up a joint and "pass collars." It should then pull quite freely.

In driving pipe, the "spring" and "vibration" of the pipe are the means of loosening the enveloping sediment. This being so, the same results can usually be achieved more safely by putting the wrist pin in the second hole of the wrist pin and applying power with reserve. It is a question whether a rapid light stroke is really more beneficial than a slower but more powerful blow.

Before shooting (see p. 40) or splitting (see p. 39) a string of casing in a hole about to be abandoned, driving should always be resorted to if the pipe is frozen, unless the conditions are known to be such as to make the risk attendant upon pulling and driving too great.

Some of the expedients that have proved successful in freeing frozen pipe in conjunction with driving and pulling are:

1. Bailing the hole dry of all fluid.
2. Filling the hole with water.
3. Ripping a hole in a bottom joint of pipe to permit sediment behind the pipe to run in the hole.
4. Drilling hole ahead.

Top driving is sometimes, but very rarely, the cause of injury to pipe. The chief tendency of this method of driving is to loosen the couplings, and, if much driving has been done, those couplings that will respond to screwing from the surface should be tightened before pulling.

Pulling upon pipe is dangerous both to men and to the pipe. Courage, tempered with judgment, is an essential factor in the success of the operation, and as there is no absolute rule for accurately judging the strength of the pipe or other equipment, the exercise of anything approaching exact knowledge in such work is difficult.

DRIVING WITH JAR-DOWN SPEAR.

A long, heavy string of pipe is more safely driven with a jar-down or drive-down spear than from the surface. Surface driving is liable to break a die collar or nipple (see figs. 5 and 6, p. 22), and if such a collar or nipple has been used for fishing purposes and is still in the hole, the drive-down spear (see fig. 3, p. 17) may be used to take hold below the die coupling.

As a long string of casing is more liable to be injured from surface driving than a short string, the jar-down spear is generally used where the string of casing is more than 2,000 feet long, and it is also used by many companies at lesser depths.

The point at which casing is frozen can be determined very accurately with a jar-down spear. Pipe vibrates from a blow when free. This vibration is plainly audible and discernible at the top of the hole. If a hold is taken with the jar-down spear in that part of the casing that is frozen, there will be no apparent effect upon the pipe at the surface. If the spear is raised from time to time and the jarring action repeated, the moment the spear has been raised above the point where the pipe is frozen, a distinct vibration of the pipe will be noted. This is called finding the "friction" on a string of casing; the process consists of taking hold with a jar-down spear in a bottom joint of casing and jarring down, raising the spear and repeating the procedure until the pipe vibrates. When the pipe starts to vibrate it is judged free from the surface to the point at which the vibration started, and frozen from that point to the bottom of the hole. In driving with a jar-down spear the hold is usually taken in one of the bottom joints of pipe.

The slips on this spear are so constructed that they slip up an inclined plane and out against the sides of the casing, and prevent the tools from going farther down the hole. By taking the first hold near the bottom of the casing before tripping the spear, the weight of the casing above assists in the driving. As it is necessary to change the hold of the spear at frequent intervals, and as this can be done only by pulling the spear up the hole, a bottom hold is necessary unless it is desired to work the spear above the point of friction.

In jarring down, the tools are strung as in fishing, with fishing jars below the stem and jar-down spear screwed on jars. The process consists of simply setting the tool and driving down with stem and jars. The hold of the spear must be changed frequently to prevent the pipe from bulging at the point of contact with the spear slips.

As in surface driving, movement is sought. If the pipe moves it is well to pull and work it up and down as much as possible, giving the débris behind the pipe opportunity to break in around the shoe and thus free the pipe.

FISHING WITH DIE COUPLING.

Steel die nipples and die collars (figs. 4, 5, and 6) are used to recut threads on a lost string of pipe and to act as a coupling after the screwing on has been completed. They are made so that they may be inserted in a collar or over the thread of a joint of pipe, and, when necessary, may even be used where the thread of the joint has been broken off and the top of the pipe left intact.

A die coupling, either steel nipple or collar, can be used successfully at any reasonable depth. The die is a case-hardened tool and can not be driven upon without danger of breaking, although it may be pulled upon with safety when properly screwed on. Such tools can not be used successfully on a "water string," as they are not water-tight. A die coupling should be selected that will not hinder the passage of tools; if not carefully selected, it may be discovered after the parted pipe is coupled together by means of the die nipple or collar that various drilling tools which are "flush" with the hole will not pass through the die coupling. This often happens with die nipples and collars used in the Mid-Continent field, and is a matter of

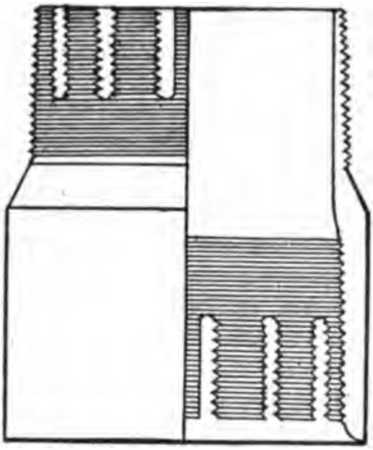


FIGURE 4.—Combination casing nipple.

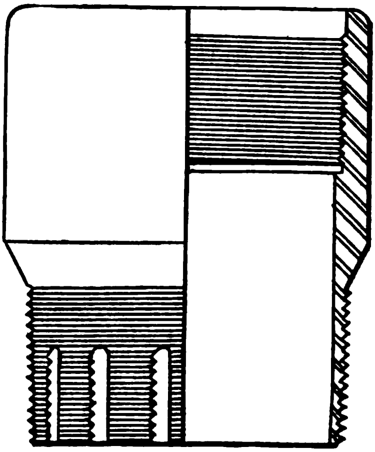


FIGURE 5.—Die nipple.

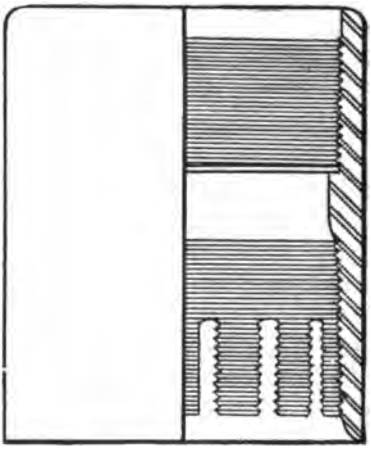


FIGURE 6.—Die collar.

serious concern if the pipe thus coupled is frozen or in such condition that pulling it out is not feasible. It is then necessary to turn all tools, such as underreamers, swages, etc., down to a size that will permit their free passage through the die coupling, because the unscrewing of such a coupling at any great depth, without unscrewing collars above the coupling, is almost impossible.

METHOD OF SCREWING ON.

The die coupling is placed upon the bottom of a string of pipe of the same size as the pipe lost in the hole. This "fishing string" is then run into the hole until the tool rests lightly upon the upper joint of the lost string. The fishing string is then turned slightly until a "drop" is felt at the surface. This "drop" is evidence that the tool has dropped into place and is resting properly upon the lost string, ready for screwing. No drop will be felt if, perchance, the tool landed in perfect order for screwing when first set upon the lost string. Pipe tongs are now put to work turning the pipe at the surface with engine power, the weight of the upper pipe being permitted to rest upon the lost pipe.

For some sizes of pipe ball-bearing races have been provided, which sit beneath a collar and on elevators and are adjusted to support the unnecessary weight of the fishing string. These races, however, are seldom obtainable, so it is here assumed that they are not in use.

As the pipe is screwed on with the engine and the die coupling begins to cut threads, little satisfactory progress will be made unless a second pair of tongs is used to hold the back spring—caused by the tortion obtained on the pipe—before the die coupling at the bottom turns and cuts.

A mark should be kept upon the fishing string. As the die coupling screws on when cutting its way, the fishing string will settle the same distance if no couplings in the fishing string also screw up. However, the couplings are almost certain to take up, but as their action can be readily felt, the amount of this "taking up" should also be judged. As the die coupling makes headway a continuous increase of power will be required to turn it. The point at which to stop screwing is determined by the surface indications resulting when engine power is applied, such as the strain on the tongs, the amount the pipe has settled, etc. The two strings of pipe should now be fastened firmly together and in condition to be pulled when desired.

USE OF CASING BOWL.

P. D. Tanguey, a master mechanic employed by the Shell Co., of Coalinga, Calif., manufactures for the use of that company a casing bowl, shown in figure 7. The drilling foreman of this company uses this tool almost to the exclusion of die collars in work that ordinarily calls for a die collar. The slips of this tool, being very thin, permit a hold to be taken upon the outside of the lost string of pipe.

Like the die coupling, a casing bowl can not be driven upon and will not exclude water. It will, however, permit a free passage to all tools and is capable of withstanding very hard pulling, but is only serviceable when there is no coupling on the top joint.

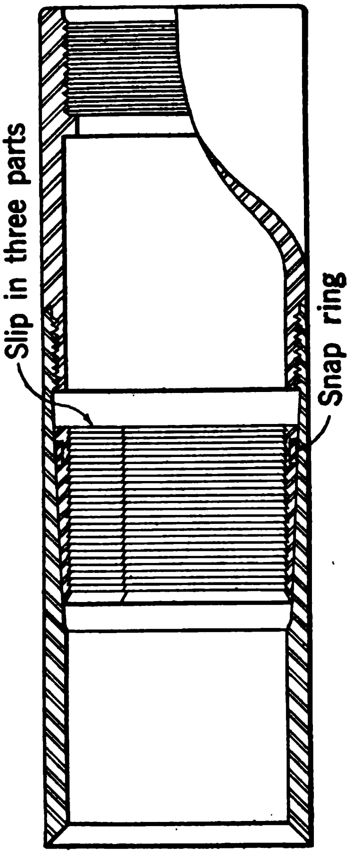


FIGURE 7.—Casing bowl; may be used in place of a die collar; permits passage of tools.

W. A. Snyder, also of the Shell Co., who has had occasion to use this tool on numerous occasions, regards it as more adaptable to the same class of work than the die coupling, as the time and labor incident to screwing on with the die coupling is unnecessary with the casing bowl.

The casing bowl is run into the hole in a manner identical to that described for the die coupling, but once the bowl has slipped over the lost string of casing, its action is instantaneous, as it takes hold of the lost string when pulled up, and the pipe is thus connected.

"BAD PIPE."

Frequently pipe remaining in a hole for some time will "go bad." This expression refers to pipe that has become dented from a "stone bruise," is in a state of partial collapse from outside wall pressure or gas pockets, or perhaps is split and partly flattened. The pulling of such pipe for the purpose of replacing the damaged joints is often inadvisable because of the danger of parting the pipe at the "bad place," leaving the lower part of the string in the hole. Such pipe is often "frozen," and attempts to free it would cause the weakened joints to part.

Bad pipe is usually first detected by the bailer hesitating in its drop as it is let down the hole. This hesitation recurring continuously in the same place leads the driller to suspect that the pipe is giving way at that place. As any slight dent in the casting is bound, from time to time, to meet the full shock of all tools being run in the hole, it is usually only a matter of time until such a place in the casing becomes so impaired as to cause the bailer to "stop up." Before the pipe has become too badly damaged the bailer can be worked past the obstruction and at times will entirely miss it, gliding past with scarcely a halt. The obstruction is next noticed with the drilling tools and eventually becomes so "bad" as to cause the tools to "stop up." The bailer will seldom pass through pipe sufficiently "bad" to obstruct drilling tools in their passage, although this condition may be overcome for a time by replacing a full-size bailer with one of smaller diameter.

SWAGING.

One of the remedies for "bad pipe" is swaging. The swage, Plate I, *B* (p. 16), is a heavy piece of steel, oval in shape, with a small groove cut into the steel as a watercourse. At its greatest diameter the swage is but a fraction of an inch smaller than the diameter of the casing through which it must pass. Thus, casing with a 10-inch inside diameter should permit the entrance of a swage 9⅞ inches in diameter. As the ultimate desire is to "run" a swage of the greatest diameter that the size of the casing will permit, a variance of even one-sixteenth of an inch is a matter of importance.

The swage is run below the stem, with long-stroke fishing jars immediately above the swage. The tools are run into the hole until the swage stops upon the "bad place" in the pipe. The "hitch" is taken for "driving" or "jarring down" as described on page 11. As the swage drives ahead from the impact of the stem and jars, the screw should be let out enough to keep the jars continually hitting down. When the swage has been driven through the "bad place" and has entered the "good" pipe below, the tools will swing free. When this occurs, the weight of the heavy swage being now added to that of the extended jars causes an unmistakeable change in "motion" and cable tension. An attempt should now be made to pull the swage back up through the "bad place" in the casing. In all probability the swage will have to be "jarrred" back through this place. The operation of driving the swage down through the "bad pipe" and jarring it back through the same place should be repeated until the swage will pull freely through the impaired pipe. It can now be safely assumed that the pipe has been extended to its normal size.

REMARKS CONCERNING SWAGING.

When a difficult swaging job is expected, the common method of procedure is to drive a swage of a small diameter through the "bad place" first. This swage is then withdrawn and a swage of greater diameter is used. This procedure is repeated until a swage of maximum diameter is driven through the impaired pipe.

If a swage has been driven through a split joint of casing and cavings are falling into the hole through the split, great care should be taken to prevent the cavings from wedging the swage in the hole—the tool being so nearly "flush" with the hole that any hard obstacle may cause it to wedge. Pulling the swage above the split pipe from time to time will act as a preventive against wedging, and in case the swage does not pull freely it should be pulled out and cleaned. A swage wedged in casing is a difficult tool to remove, as it is not unusual to jar a pin off in attempting to jar the swage past cavings or broken pieces of pipe that may accumulate above it, unless care is taken. It is always possible to jar a swage up through pipe through which it has been driven if no débris has accumulated upon the top of the swage.

Pipe has seldom, if ever, been severely injured by a swage, but should not be swaged, if avoidable, unless sitting on a shoulder or bottom. Pipe, if hanging in the hole, may easily be parted with a swage.

Swaged pipe frequently goes bad a second time, necessitating a repetition of swaging. It may be considered that the pipe is weakened with each swaging. Where possible an inside string of pipe should be inserted with a tapered guide of wood or cast iron upon the bottom of the shoe to guide the shoe through the swaged pipe. This pipe will ordinarily keep the hole in better condition.

Tools with swage attached should never be raised above a "bad place" in the casing and allowed to descend swiftly. When this is done, if the swage stops in the "bad place" in the casing and is then knocked through with one blow by the descending stem and jars, the swage being heavy may fall so forcibly as to "jump" a pin when the jars receive the weight of the swage. This practice is especially dangerous where two sets of jars are used.

COLLAPSED CASING.

Pipe in a hole usually goes "bad" gradually, and may sometimes collapse gradually, but as a rule collapsing takes place instantaneously and often above tools in operation, causing them to be shut in below the collapsed pipe.

A typical example of collapsing casing occurred in a wild-cat well in Colombia, South America. The hole was 2,210 feet deep. Ten-inch pipe of a standard make weighing 40 pounds to the foot was being used. The pipe was in good condition, but because of circumstances unnecessary to explain, it was decided to land the pipe and bail the hole.

The pipe was landed and bailing of the hole was commenced. The water was lowered to a depth of 1,150 feet. At this stage of the work the pipe collapsed at 1,600 feet.. There was a sharp report, resembling the explosion of a charge of dynamite in the hole, and a rush of air which blew the hats off the men who were standing near the hole. This was followed immediately by a column of water that gushed to a height of about 50 feet. The water was followed by gas, making it necessary to extinguish the fires under the boilers.

After collapsing, pipe will often be completely sheared off, and the damaged pipe pulled out will be flattened and split. The presumption is that the top of the pipe left in the hole is in the same condition. However, more often the pipe, although badly flattened and split, will cling together, which necessitates driving at the top with tools and drive-clamps before the shattered pipe will break.

DRILLING PAST OR SIDETRACKING CASING.

Drilling past pipe is a comparatively easy matter in caving territory, but a very difficult undertaking where the formation is hard and "stands up." The necessity for drilling past pipe in hard territory, however, is far less frequent than in caving territory. The conditions liable to collapse are more frequently found where the formation caves, and in such a formation the remedy is the more easily applied.

TIME CONSUMED IN "DRILLING PAST."

When confronted with a job that necessitates "drilling past," the operator, unacquainted with the process, believes that the time and risk involved may make moving the rig and starting a new hole more practical and is doubtful as to which is the better method of procedure.

When the territory is suited to "drilling past," the redrilling often proceeds, after a successful initial start, far more rapidly than did the original drilling of the same formation. The greater facility of redrilling is accounted for by the formations having been somewhat broken by the original drilling and by the cuttings from the tools finding an inlet to the old hole. The elimination of the cuttings in this way keeps the hole much cleaner, with less bailing than in the original drilling.

It will also be found that the underreamer is used less than in the first drilling. The formation seems to break to a greater width from the impact of the bit alone, and hard strata that occasioned the use of the underreamer when the hole was first drilled, are often undetected in the second drilling.

ULTIMATE CONDITION OF HOLE.

It can not be maintained that drilling past a string of casing, and carrying a second string of pipe to the intended depth past the old casing, leaves a hole in as perfect condition as it would be in the event that sidetracking had not been necessary, but the general results of such work are highly encouraging. There is little more reason to expect trouble from a string of casing landed successfully by drilling past an old string than there would be if the conditions were otherwise, although the new string may suffer from the causes that occasioned the original casing to fail.

"SIDETRACKING" A COMMON PRACTICE.

Sidetracking casing is such a common, in fact, daily occurrence in many localities that citations from the hundreds of examples where such work has been successfully performed is unnecessary. One of the many instances of such work will be enough—that performed on well No. 4, of the American Petroleum Co., section 30, Coalinga, Calif. This well—an old producer at the time of the writer's knowledge of it—had 10-inch pipe broken off within, and successfully sidetracked on four different occasions. On the last occasion the 10-inch pipe was pulled, but more than 250 feet of the string was left in the hole. The bottom joint of the pipe pulled out was replaced with a new joint, a 10-inch shoe being used. The lost pipe was sidetracked, the new string landed, and the well put to pumping within two weeks.

In the example cited on page 26, where the pipe collapsed at 1,600 feet, the original depth of the hole was 2,210 feet. The 610 feet of hole, thus lost by the collapsing of the pipe, was redrilled in less than one-third of the time consumed in drilling the original hole.

TOOLS USED IN SIDETRACKING CASING.

Tools used in sidetracking casing are many and varied when the work does not proceed with the ease anticipated. They are largely a matter of individual choice and construction, however, and usually are dispensed with in favor of the ordinary drilling tools. Bits are sometimes drawn far out to one side until they are bootlike in appearance, upon the theory that the extended point will reach a troublesome sliver of the old pipe that may be obstructing the passage of the new pipe. Reamer bits, flat on the surface and rounded to the "full" of the hole, are also used, but although the reamer bit is recommended, unless the job is of an unusual kind, the ordinary drilling tools suffice for all purposes.

IMPORTANCE OF "CLEAN START."

In drilling past it has been proved that if the work be not unduly hurried in the beginning, and the pipe receives a clean start past the top of the old pipe, the work will progress more favorably than if this start is forced.

A bit is put to work, as in ordinary drilling, upon the top of the old pipe. After enough progress has been made for the insertion of a joint of casing, the pipe should be "tried." If the slivered casing obstructs the passage of the pipe, the hole should be underreamed until the barrier is forced into the wall, or broken off. When this happens the first joint of pipe will start past the old pipe. From now on ordinary drilling problems only are met, with the exception of an occasional troublesome sliver of the old pipe interfering enough to cause momentary delay.

ODD FEATURES OF SIDETRACKING PIPE.

The new casing should be raised only when unavoidable, as the old pipe often falls back into the hole if the casing is raised, thus necessitating a repetition of the work.

Turning the casing will often cause it to pass a sliver obstructing at an unexpected moment. On the other hand, an unfortunate turn of the casing will sometimes cause it to encounter an obstruction at a place in the hole through which it had previously passed freely. This action of the casing is referred to merely to illustrate the peculiar behavior of casing at times and not because it is of great importance.

After the initial start, the old pipe may not again be encountered. In most cases, however, when freedom from contact with the old pipe is maintained throughout the greater part of the redrilling, the bottom joint of the old string will be encountered and some trouble will be met in passing.

The balance of opinion as regards the choice of shoe to be used for this operation favors a plain shoe. It is contended that the occasional advantage obtained by a tooth shoe in eliminating a sliver is more than offset by the tendency of such a shoe to create slivers and catch others that a plain shoe would pass.

PRESSURES ALLOWABLE ON COMMERCIAL WELL CASINGS.[a]

The next step in the design of a water string is to determine the pressures that may be safely carried on the various sizes of commercial well casings. The most authentic information at hand on this subject is that published by Stewart.[b] This paper formed the basis of a study by Chester Naramore and R. S. Hazeltine, at Coalinga, Calif., in 1911. Later, Hazeltine presented a paper[c] on the results of Stewart's work as applied to the needs of the oil industry. Either of these papers will repay a thorough study by anyone facing water problems in drilling wells.

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[a] From "Methods of shutting off water in oil and gas wells," by F. B. Tough. Bull. 163, Bureau of Mines, 1918, pp. 16-20.

[b] Stewart, R. T., Collapsing pressures of Bessemer steel lap-welded tubes, 3 to 10 inches in diameter: Trans. Am. Soc. Mech. Eng., May, 1906, pp. 730-822.

[c] Hazeltine, R. S., Collapsing pressure of steel tubes: West. Engineering, vol. 1, July, 1912, pp. 295-297.

TABLE 1.—*Collapsing pressures and capacities per linear foot of lapwelded steel casing of sizes commonly used in California*—Continued.

Size	Weight per foot.	Outside diameter.	Inside diameter.	Thickness.	Collapsing pressure per square inch.	Equivalent water column.	Water column with safety factor of 2.	Capacity per linear foot.	Capacity per linear foat.
Inches.	*Pounds.*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	*Feet.*	*Feet.*	*U. S. gals.*	*Cu. feet.*
10	45	10.750	9.960	0.395	1,800	4,150	2,075	4.0440	0.5406
10	48	10.750	9.902	.424	2,030	4,680	2,340	3.9976	.5344
10	54	10.750	9.784	.483	2,510	5,780	2,890	3.9026	.5217
11	47	11.750	11.000	.375	1,380	3,180	1,590	4.9334	.6595
11	60	11.750	10.772	.489	2,220	5,120	2,560	4.7307	.6324
11⅝	40	12.000	11.384	.308	840	1,940	970	5.2827	.7062
12½	40	13.000	12.438	.281	500	1,150	575	6.3083	.8433
12½	45	13.000	12.360	.320	750	1,730	865	6.2298	.8328
12½	50	13.000	12.282	.359	1,010	2,330	1,165	6.1497	.8221
12½	54	13.000	12.220	.390	1,210	2,790	1,395	6.0869	.8137
13⅜	50	14.000	13.344	.328	640	1,470	735	7.2598	.9705
15½	70	16.000	15.198	.401	790	1,820	910	9.4150	1.2586

FISHING WITH OVERSHOT.

Of the innumerable tools for pipe fishing, the writer has chosen the overshot (fig. 8) as being sufficiently important for detailed description.

Overshots (see Pl. I, *C*, p. 16) have three flat springs about 16 inches long, 1¼ inches wide, and ¼ inch thick, but varying in size to correspond to the size of the overshot. The springs are held erect within a steel bowl. The overshot is run upon pipe larger than the string lost in the hole. When the overshot comes in contact with the top of the lost pipe, it slips over that pipe, and travels down over the collars. If unhindered by cavings or other obstacles, the overshot can be run to the bottom of the hole. The well then has one string of pipe within another. When the overshot is raised the upright springs catch under a collar of the lost or inner pipe and this pipe, if free, can then be pulled; however, should it not be free, and the outside string be known to be the stronger, the inner pipe may be pulled apart. The overshot, although a delicate appearing tool, is capable of withstanding considerable strain. This tool is an excellent one for catching tubing or casing that has been dropped and is broken and crooked, provided it is reasonably certain that the casing or tubing has not become fast in the hole so that excessive strains will be required to pull it.

FISHING WITH CASING SPEARS.

There are many types of casing spears manufactured for fishing out casing. However, they may be classified under two heads—bulldog and trip spears.

Every care should be taken to avoid running a spear below a breach in the pipe that will permit débris or broken pieces of casing to fall upon the spear. Under such adverse circumstances the best trip spears are likely to "bulldog" in the pipe and they are a very stubborn tool to remove when once "fouled."

Regardless of selling advertisements to the contrary, spears of whatever make will damage pipe, at the point of contact of slips and pipe, if heavy jarring is continued too long in one place without changing the "hold." When the hold should be changed is a matter depending entirely upon the judgment of the driller and the weight and condition of the pipe for which he is fishing.

BULL-DOG SPEARS.

Bulldog spears (fig. 9, p. 34) are so constructed that once the spear is run into the pipe being fished for, it can not again be raised without taking all or part of the pipe with it. In other words, the hold may be broken and a lower hold taken, but the spear can not be pulled up without gripping the pipe. Before running this tool, if a stubborn jarring job is anticipated, due care should be taken that all equipment is in good condition, because "something has to come." The pipe must either be freed in toto or jarred apart and an upper part removed.

TRIP SPEARS.

Trip spears (fig. 10, p. 35) are so constructed that the hold may be broken and the spear withdrawn at the will of the driller. Trip spears are made with two and four slips. The 4-slip spear is intended to be less injurious to the pipe than the 2-slip spear. The spear that is less liable to damage pipe permits the longest "jarring" in one spot without changing "holds."

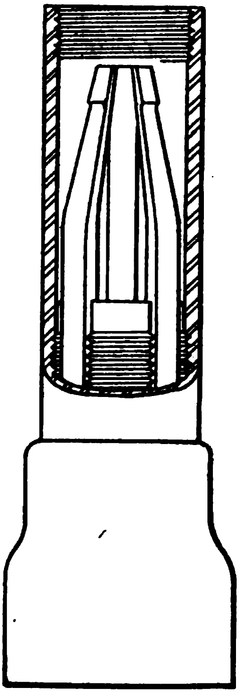


FIGURE 8.—Overshot. The springs pass down over pipe and couplings, but catch under a coupling when pulled up.

For stubborn jobs, whenever obtainable, trip spears should be used in preference to bull-dog spears. Should any accident occur and be detected, such as the slow unstranding of a wire cable due to a broken strand, or should the job prove stubborn enough to require a change of method, or should any one of innumerable reasons demand that the hold be broken and the tool pulled out, the use of the trip spear would permit this being done.

JARRING UP WITH SPEAR.

Assume a hole to be 2,300 feet deep and the pipe frozen. Light driving at the surface with clamps and drivehead would probably be the first step after precaution was taken to keep the pipe from dropping. This failing, the jar-down spear would be used (see fig. 3). Should the jar-down spear also fail, the "friction" would be ascertained by obtaining vibration before withdrawing the spear. A trip drive-up spear would now be placed upon the fishing jars left on the bottom of the stem when the jar-down spear was removed. Assume that the "friction" has been found to be behind the last 200 feet of pipe or between depths of 2,100 and 2,300 feet. The "stretch" of the casing would first be taken and held; a hold would then be taken in the pipe with the spear at 2,270 feet or about midway in the second joint from the bottom, or midway in the shoe joint, if preferred.

Jarring up would now be started. The hold would be changed, from time to time, according to the possibility of its injuring the pipe. Signs of vibration in the pipe would be watched. The spear having hold within the part of the casing bound by wall "friction," no vibration would be had unless movement, though ever so slight, were obtained. Should vibration be obtained, it would start faintly with the first slight movement of the casing. This vibration would increase as the pipe became more free. When the vibration was distinct enough to justify the effort, the trip spear would be withdrawn (it will be noted that a bull-dog spear could not be withdrawn) and the pipe would be worked with the engine. Movement having been obtained, the success of the operation should be assured, although a repetition of the process might be necessary before the pipe would pull.

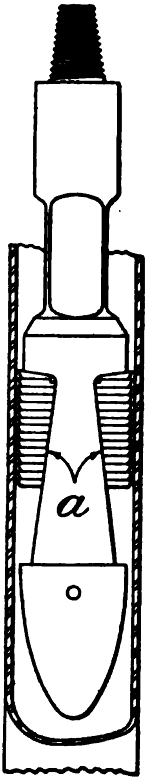
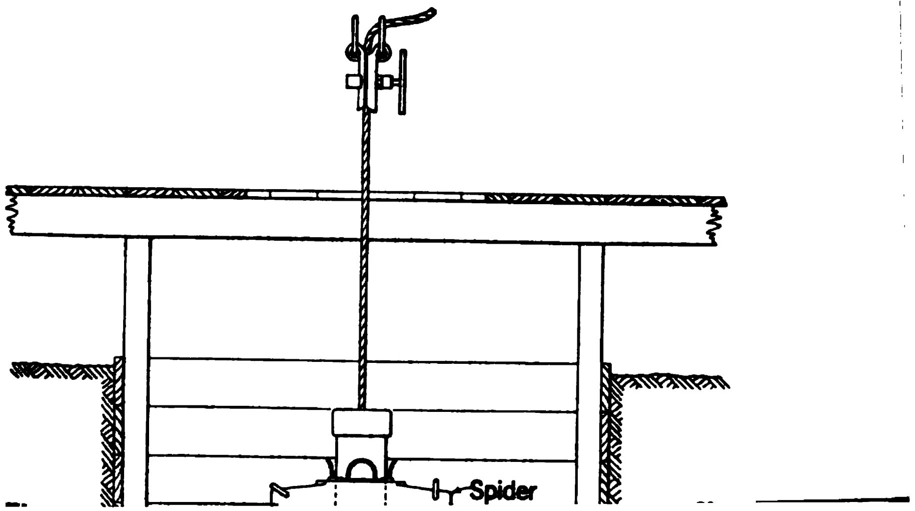


FIGURE 9.—Bulldog casing spear. Once the tool takes hold it can not be withdrawn, because upward movement will cause the slips *a* to slip down the inclined plane and lodge against the pipe.

FISHING WITH SPEAR AND HYDRAULIC JACKS.

If vibration were not obtained and the pipe not freed as described above a pair of hydraulic jacks might be used to assist in loosening the pipe. Each of these jacks is usually capable of lifting 100 tons. They should be placed upon a firm footing (see Pl. II), one on each side of the casing, and the ordinary small spider placed over the pipe with an end resting upon each jack. The pipe is then "stretched" to the utmost margin of safety, and the slips inserted in the spider


Spider

to shear a passage at the bottom of the spear or break out the dovetails, thus permitting the slips to drop into the hole below. This method is very severe on the shoe, but is effective and can be used as a last resort. Care should be taken to prevent a spear from bull dogging unintentionally, as complications that may cause a serious fishing job are possible in breaking the hold by the methods just described.

FISHING WITH MANDREL SUBSTITUTE, SPEAR, AND JACKS.

In construction, a mandrel substitute (see Pl. II, p. 34) is like a wire-cable socket except that no cable hole is bored in it, and it has between the wrench squares and the "neck" a thread fitted to a pipe coupling. It is used where a short string of pipe has been left frozen in the bottom of a hole. The top joint of this pipe may be split (see Pl. II). The method of use is as follows:

The mandrel substitute is screwed tightly into a pipe coupling of the same size as the lost "string." The neck of the substitute is inside the pipe, and the bottom of the pipe is "plugged" by the substitute. A short stem, or "sinker," long enough to reach below the split (if present) in the top joint of the lost string, is placed upon the mandrel substitute. Either a bulldog or trip spear may be used upon the stem. The use of jars between stem and spear is seldom necessary, and when used the jars frequently cause trouble. Because of the small space in which jars have to operate in this work, and the tendency of a spear to take a lower hold when "knocked" further down a hole, jars are only occasionally an aid in breaking a hold. Usually a bulldog spear is used without the aid of jars, upon the theory that "something has to come."

Assuming that jars[a] are not used, the tools should now be "strung" as follows: The mandrel substitute is screwed into the coupling, a short stem is screwed into the mandrel substitute, and a spear screwed into the stem.

The pipe with the tools attached, as described, is run into the hole until the spear enters the lost pipe and is below the split, if such exists, in the top joint (see Pl. II). The fishing string is then raised and the "stretch" held with a spider placed upon hydraulic jacks, as described on page 34. The cable tools are now used. Fishing jars are placed upon the bottom of the stem, and a combination socket (see Pl. II) with "slips" fitted to the neck of the mandrel substitute is screwed upon the jars. The tools are now run into the pipe and the combination socket takes a hold upon the neck of the mandrel substitute. A hitch is taken with the cable tools and jarring up is commenced. The process is now identical in operation to that described on page 35. The jacks are operated in unison with the jarring, and the operation is continued until the frozen pipe is freed or parted. As the hold of the combination socket is easily broken when desired, the tools may be withdrawn at will and the pipe pulled with the portion of the lost string jarred loose. The operation can then be repeated. For successful fishing with a mandrel substitute, the walls of the hole must either stand up or be held in place by a protecting string or casing.

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[a] Driving the pipe at the surface to break the hold should trip a trip spear as readily as would the jar.

CUTTING CASING IN THE HOLE.

When only the lower part of a string of pipe is of service in a hole, the recovery of the unserviceable part of the pipe is often desirable. For example, a hole has 450 feet of 12½-inch pipe within it, 1,500 feet of 10-inch pipe has been landed and the water shut off with this string. At 2,000 feet the 8-inch pipe freezes and is permitted to remain in place. The well is finished by inserting 2,500 feet of 6⅝-inch casing. If the chance of any of the outside strings collapsing or "going bad" is considered slight, the pipe could be cut off near the bottom of each protecting well string and the upper part of the pipe recovered without damage to the hole. The 6⅝-inch pipe could be cut off at 1,950 feet and this part recovered, leaving the lower 550 feet in the hole. Such a cut would leave a 50-foot lap of 6⅝-inch pipe extending up into the 8¼-inch. Similarly, 1,450 feet of 8¼-inch casing could be recovered, leaving the lower 550 feet in place and a 50-foot lap of 8¼-inch pipe extending up into the 10-inch. After cutting the pipe, either the top of each cut joint in the hole would have to be swaged until it "belled out" tight against the outer string, or else an "adapter" (fig. 11), would have to be placed on the top of the cut joint. The adapter fits over the cut joint and is prevented from sliding down over the pipe by means of a "shoulder" which rests on the top of the pipe. The top of the adapter is tapered and the outside is flush with the casing through which it is inserted. Were the pipe not "belled out," or an adapter used, the tools would catch on the cut pipe in passing down the hole. When more than one string of pipe is to be cut, each adapter should be set before the next larger string is removed from the hole.

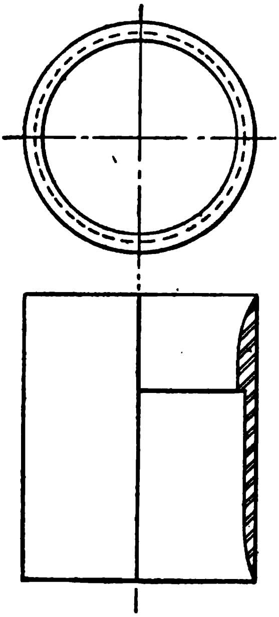

FIGURE 11.—Casing adapter, for adapting one size of casing to another, and permitting tools to be lowered into the well.

USE OF CUTTERS.

The similarity of the various casing cutters now extensively used, makes their operation identical. Knives, *a* (see fig. 12), as in ordinary pipe cutters, varying only in size, are held in sliding steel blocks, *b*, mounted in a cylindrical steel frame, *c*. The knives are forced against the pipe by a tapered steel mandrel, *d*, inserted behind the steel blocks, *b*, through a hole in the center of the steel frame.

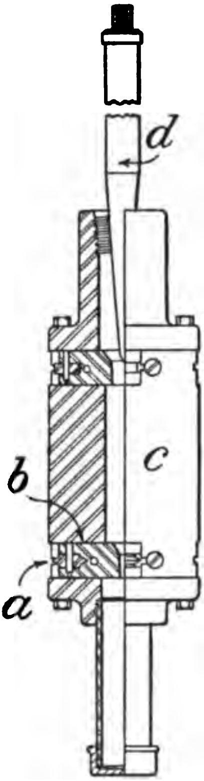

FIGURE 12.—Casing cutter. *a*, Knives; *b*, steel blocks; *c*, steel frame; *d*, mandrel.

Before "running" the cutter, enough "stretch" should be taken upon the casing and maintained by means of elevators or spider and slips to cause the pipe, when cut in two, to jump just enough to give notice that the operation has succeeded. This stretching also eliminates the problem of "slack" pipe that would otherwise arise. After the pipe is stretched, the cutter is placed on tubing and run into the hole to the desired depth. A ball-bearing race, though not absolutely essential, should be placed between the elevators and the tubing coupling, immediately above them. This race makes the turning of the tubing less difficult and acts to prevent the tubing from screwing up in the couplings and raising the cutter when the tool is turned.

A set of long-stroke jars small enough to enter the tubing and with a pin of the same size and thread as a sucker-rod pin are placed above the mandrel. From two to four iron sucker rods are placed above the jars. The connected equipment is attached to the sand line, run into the tubing, and permitted to strike lightly upon the cutter, where it will stop. The tubing is then turned by hand power. The weight of the rods above the mandrel forces the blocks containing the knives out against the casing. Sometimes this weight is sufficient for the work, but when it is not, and the cutter turns with so little effort as to convince the drillers that it is making little progress, the jars between the mandrel and sucker rods may be operated by hand, or engine, or by raising and dropping the sand line. When the rods are raised with the sand line and the jars parted without pulling the mandrel out of the cutter, the mandrel drives farther between the sliding blocks each time the rods fall against it and forces the knives farther into the pipe metal and holds them there. The mandrel should not be driven between the blocks too tightly or the tubing can not be turned.

Usually 20 to 40 minutes' turning of the tubing is required to cut the casing. If the casing is not cut after 1½ hours' turning and the tubing is pulled, it will probably be found that the knives were forced too rapidly by the mandrel and were broken. They can then be replaced and the operation repeated. When the casing is cut it will jump from the stress obtained and must be held before running the cutter. The mandrel and rods should then be pulled, the tubing should be raised gently until the cutters are started into the upper pipe and should then be pulled; afterwards the loose casing should be pulled. An adapter (see fig. 11) should then be inserted over the cut joint in the hole or else the top of the joint should be "belled out" with a swage, as formerly described.

SPLITTING CASING IN THE HOLE.

Casing splitters[a] are operated by driving down with the drilling tools, with long-stroke jars on the bottom of the stem and the splitter (see fig. 13) attached to the jars.

The simple construction of the splitter makes it a safe and practical tool. The impact of the jars when the tools strike causes a knife, *a*, in a sliding block, *b*, which is forced up and against the pipe from the bottom by a mandrel, *c*, held in place by tension of the spring, *d*, against the pipe, to cut through the pipe. The knife is held stationary in the block, *b*, by a steel pin, *e*, extending through the block and the knife. The steel pin also holds the block in the frame of the splitter. Before running the splitter into the casing, the spring, *d*, is raised up the mandrel by compressing with the fingers the small trigger, *g*, at the bottom of the mandrel. When the tool is lowered in the hole, there is enough pipe friction upon the spring to prevent its dropping back over the trip trigger. Should the spring lack tension and in some manner drop back while the splitter is being run into the hole, the mandrel would at once raise against the block and a hole would be forced in the pipe by the jars striking.

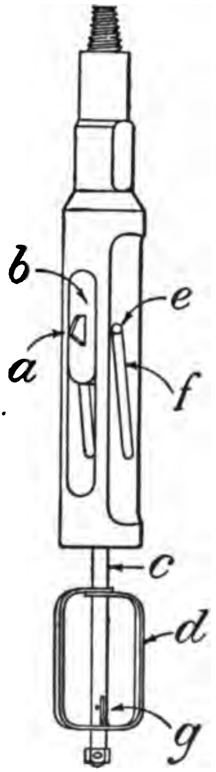

FIGURE 13.—Casing splitter. *a*, Knife; *b*, sliding block; *c*, mandrel; *d*, spring; *e*, steel pin; *f*, inclined slot; *g*, trigger.

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[a] Wagy, E. W., Uses of perforated casing and screen pipe in oil wells: Tech. Paper 247, Bureau of Mines, 1919, p. 9.

When the tool is lowered to the desired depth it is then raised, the mandrel draws up through the spring, and the trigger snaps into place. Then the splitter is tripped. The knife will thrust a hole through the pipe with the first impact of the jars. Care must then be taken to keep the jars from "hitting up." Should the jars "hit up," the knife will be withdrawn from the pipe and will probably be broken. After "hitching on" the splitter will drive readily, cutting a slot in the pipe in its progress, until a coupling is reached. The progress of the knife will be retarded by the coupling but not stopped. When the coupling is split, the pipe can then be pulled, although the coupling sometimes fails to spread enough to permit pulling without light driving of the pipe at the top by clamps and drive head.

USES OF CASING SPLITTERS.

Casing splitters are most commonly used to recover casing when a hole is about to be abandoned, and when the work involved in freeing the pipe, so that the entire string can be recovered, would prove too expensive.

Casing splitters may also be used as perforators[a] to cut holes in casing. Some splitters are constructed with two knives, by the use of which two separate cuts are obtained. Splitters will not always take the place of cutters, as the former are liable to leave the uppermost joint of pipe left in the hole in a split condition, which is undesirable for a hole in which further work is to be done.

A slight stress may be held upon pipe about to be split, but the stress should not be excessive, as the jarring down upon the coupling being cut increases the stress on the upper couplings, and excessive stress can cause the pipe to part above the splitter.

When pipe has collapsed or is so "bad" as to make the redrilling of a hole necessary, if the pipe will not pull, it may be split above the "bad place" more easily than it can be cut and with equally satisfactory results.

In splitting pipe, the wrist pin should be placed in either the first or second hole of the crank shaft in order to avoid breaking the knife with too forcible a blow. This will also minimize the chances of the jars striking both ways.

SHOOTING OFF CASING.

A study of various Bureau of Mines publications, particularly Technical Paper 6,[b] has convinced the writer that a lack of technical knowledge of fuse and explosives is responsible for some of the unexplained fatalities that have occurred in the oil fields.

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[a] Wagy, E. W., Uses of perforated casing and screen pipe in oil wells: Tech. Paper 247, Bureau of Mines, 1919, pp. 10-17.

[b] Snelling, W. O., and Cope, W. C., The rate of burning fuse as influenced by temperature and pressure: Tech. Paper 6, Bureau of Mines, 1912, 28 pp.

Investigations throughout the various fields have proved that the recent tendency is to resort to the old-fashioned methods of shooting off casing, and to exact from the drilling crew a service that should be placed only in professional hands. Professional shooters (this does not refer to nitroglycerin shots used to stimulate oil production) place their shots in galvanized-iron containers and explode the charge electrically, the wire usually being lowered in the hole with the shell, by means of the sand line. Because of its being apparently simple and practical, the advantages and disadvantages of this method of shooting casing should be thoroughly investigated before the method is discarded.

Many operators contend that the shots placed in galvanized-iron containers and exploded electrically by professional shooters are responsible for the occasional joint of split pipe found as much as a thousand feet above the shot. The writer is aware that pipe is so damaged by occasional shots, but is not convinced that the old tubing method of shooting is an absolute preventive of such damage.

WHY CASING IS SHOT.

To recover frozen casing from wells about to be abandoned, it frequently pays to shoot the casing off near the bottom and pull the remainder. In case the pipe will not pull, a shot may be placed higher, and this procedure continued until the pipe will pull. Shooting off pipe in this manner does away with a large expenditure for labor and equipment necessary in driving, cutting, splitting, etc. Although a greater amount of pipe is lost than would be in driving, cutting, and splitting, this loss is offset by the saving of labor, haulage, equipment, etc.

If a well is cemented and the water has not been shut off, many operators run a drive-down spear into the well, ascertain the "friction" on the pipe by raising the spear until vibration is obtained, and shoot the pipe into shreds the entire length of the friction. The point of friction being above the top of the cement, the pipe is freed. The pipe is then pulled, all damaged joints removed, a shoe placed upon the bottom joint, and the hole redrilled and recemented.

SHOOTING WITH TUBING.

One method of placing a shot for the purpose of shooting off casing for its recovery is as follows:

A steel nipple 4½ inches in diameter and 3 feet long has a plug securely screwed into the bottom coupling. In the top coupling is a bushing 4½ inches in external diameter and 2 inches in internal diameter. Two joints of 2-inch tubing are screwed into the top of the bushing (see fig. 14). The charge of stick gelatin or dynamite—20 to 40 sticks of 60 per cent explosive—is placed in the container of 4½-inch pipe at the bottom. The tubing has a plug in the top, making the container water-tight. An explosive cap crimped to the fuse is inserted in a stick of the explosive. The paper at the top of the stick of explosive is wrapped with string to the fuse. This squib is lowered through the tubing by means of the fuse until it rests upon the explosive in the container at the bottom of the tubing. The fuse is then cut off at the top of the tubing and lighted. The plug is screwed back into the tubing. The container is now lowered by the sand line until it is at the required spot in the casing. After the shot it will be found that the sand line is uninjured by the explosion.

When it is desired to place an extended shot of several hundred feet, as in cemented but leaking pipe, the vibration is obtained by a drive-down spear, as previously explained. On the assumption that a hole has 2,000 feet of pipe cemented within it and the vibration is found at 1,700 feet, a 300-foot shot would be necessary to free the pipe. An entire string of 2½-inch tubing could be used with a plug in the bottom joint and the lower 300 feet of the tubing could be filled with stick gelatin. The caps could rest in a small receptacle at the top of the explosive (see fig. 15). An iron dropped through the tubing would explode the charge and shatter the casing and tubing for 300 feet.

As both methods of tubing shooting described here are done under water, unexpected damage is seldom caused. With the latter method, the tubing can be pulled and will be undamaged above the place where the shot was placed. The danger in this method of shooting is evident when it is realized that any heavy piece of débris falling through the tubing would explode the shot.

ILLUSTRATIVE FISHING JOBS.

The writer has chosen a few actual fishing jobs in order to illustrate the application of fishing tools by skilled men in daily practice.

MYERS NO. 3 WELL, UNION OIL CO., CALIFORNIA.

At Myers No. 3 well, of the Union Oil Co., in a California field, the drillers were E. P. Weiman, Boyd Smith, J. A. McMillan, and Superintendent J. A. Kammerdiner. In this hole two strings of pipe were cemented together. It was desired to loosen and recover the inner pipe without disturbing the outer pipe, which was a water string. The hole had within it 3,140 feet of 10-inch pipe. Within the 10-inch pipe was 3,300 feet of 8¼-inch pipe. When the well was cemented, the cement had raised between the two strings of pipe to a height of 1,930 feet from the surface. This left 1,210

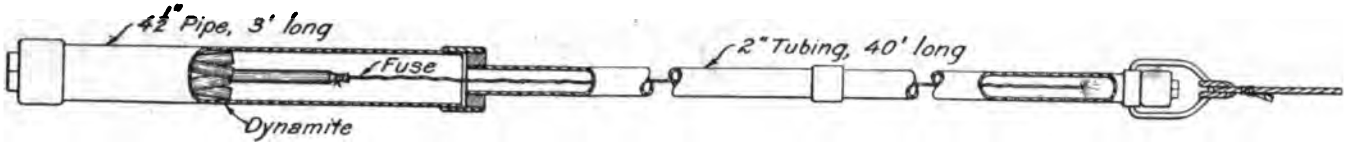


FIGURE 14.—Tubing shell for sand-line shot, used to shoot off casing. Run on sand line.

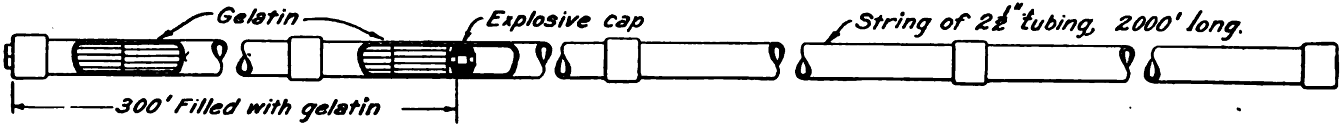
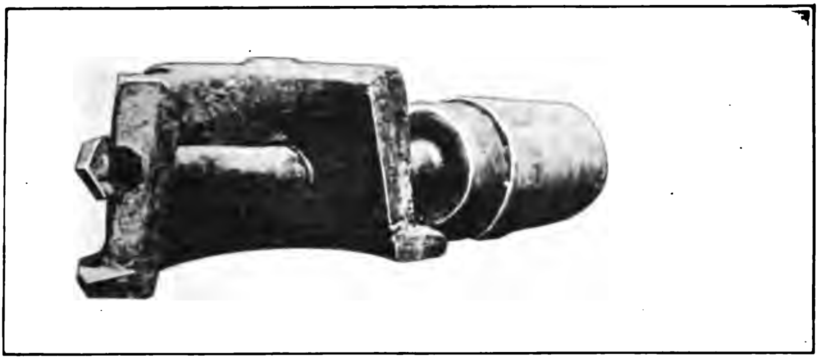


FIGURE 15.—Complete string of tubing with the lower joints filled with explosive. Used for extended shot to shatter casing for a given length in order to redrill.

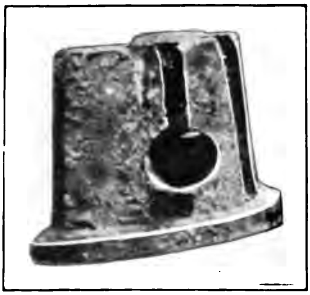
feet of 10-inch and 8¼-inch pipe firmly cemented together at the bottom of the hole. The 8¼-inch pipe was cut off with casing cutters at 1,930 feet, and this amount of pipe was recovered. Then the 8¼-inch pipe remaining in the hole was recovered in short sections by splitting the collars. Sometimes only the collar at the lower end of the top joint would be split. A trip spear would then be run and this joint would be jarred out of the encircling cement and pulled. Two or three joints at a time were the most the drillers ever tried to recover after having made a successful but laborious effort to obtain five joints at one time. This procedure was continued until the 1,210 feet of 8¼-inch pipe cemented within the 10-inch pipe was recovered; 160 feet of 8¼-inch pipe still remained in the hole below the 10-inch pipe. This pipe was sidetracked with a new string of 8¼-inch casing, which was successfully landed at 3,600 feet. Also, 4,278 feet of 6¼-inch casing was landed, and the time the writer obtained this information, 4½-inch pipe was still being carried at a depth of 4,595 feet. The cleaning of this hole took six weeks, and the 10-inch water string was not injured.

LAMERCED NO. 13 WELL, UNION OIL CO., CALIFORNIA.

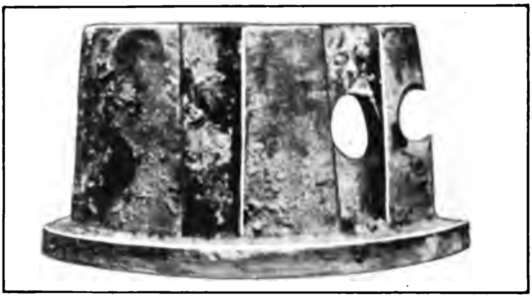
At the Lamerced No. 13 well, of the Union Oil Co., in California, the drillers were Omar Hinds, Robert Graham, and Harvey Hoxworth. The hole was 2,411 feet deep. In reaming with a rotary a 4-way bit was lost at 2,000 feet. This bit was then 411 feet off bottom. Seventy feet of drill pipe had been left upon the top of the bit, but as the top joint had been ground up, by rotating with the pipe before it was discovered that the bit was lost, only 50 feet of pipe remained upon the top of the bit. Grabs were run, and the remaining half of the top joint of pipe, twisted into a knot about 18 inches long, was recovered. The remaining 50 feet of pipe was fished out with an overshot (see fig. 15, p. 43), but the bit had come out of the drill collar and remained in the hole. A 10-inch combination socket was now run with 5-inch by 6-inch pin slips to catch the bit, and a small piece of pipe was recovered. A mill (Pl. I, *D*, p. 16) was run until the drillers were certain it had reached the bit; then the mill was pulled and replaced by a set of jars over a 12½-inch combination socket. The combination socket gripped the bit, but the bit would not pull. The drill pipe was now swung against the bit by using a jerk line, but the bit still held firm. The hold of the combination socket was then broken by rotating, with water circulating around the jars until the slips mudded up. The combination socket was replaced with a spud (see Pl. I, *D*). The pipe was worked up and down and circulation maintained through the spud. The spud was then pulled and the bit was fished out with the 12½-inch combination socket fitted with 7¾-inch slips.



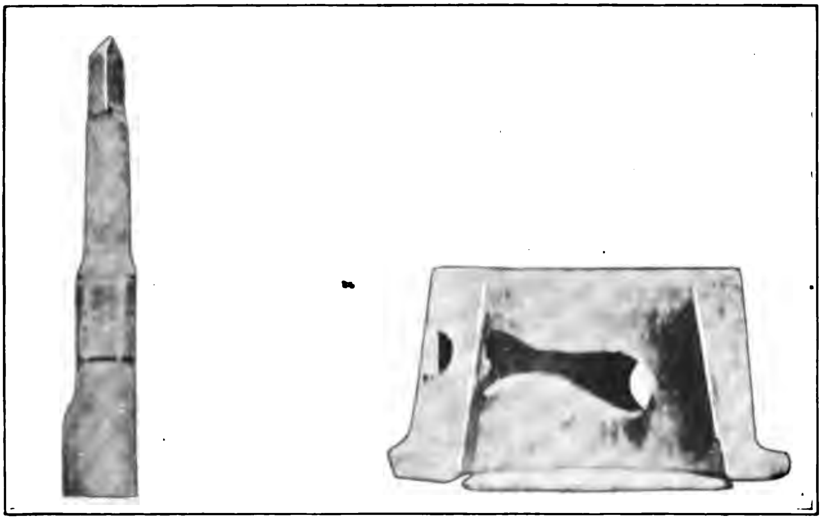
A. DRILLED BUSHING, WITH DRILL IN PLACE.



B. DRILLED BUSHING.



C. DRILLED BUSHING, ANOTHER VIEW.



D. DRILLED BUSHING, DRILL REMOVED.

AN UNUSUAL FISHING JOB.

A rotary table bushing was dropped in a rotary hole on the Amalgamated lease in California. A hole about 4 inches in diameter was drilled through the bushing by rotating upon it a steel drill. After the drill had cut a hole, the thread near the top of the drill entered the hole. The thread, being tapered slightly, tightened enough as it screwed up to warn the driller when to stop rotating the pipe. The pipe was then pulled and the bushing recovered. Drilling the hole took but 40 minutes turning of the pipe. A view of this bushing, with the drill still in it, is shown in Plate III, *A*. Views of the bushing with the drill removed are shown in Plate III, *B*, *C*, and *D*. The double hole in the side of the bushing, shown in Plate III, *C*, was made by the drill cutting out a part of the bushing where it was cored, causing a second and unnecessary hole in one side of the bushing.

LUBRICANTS FOR ROTARY TOOL JOINTS AND FOR CASING THREADS.

The following formulas for lubricants were supplied by E. S. Durward, of the Shell Oil Co., Coalinga, Calif.

Formula for lubricant for rotary tool joints.

	Per cent.
Tallow	33.4
Starling white lead ground in oil	23.2
Graphite	2.9
Cylinder oil	40.5

Melt tallow, add white lead, mixing well. Then add oil, stirring continually Then add graphite and mix all together.

Formula for lubricant for casing threads.

Tallow	pounds	200
Sterling white lead ground in oil	do	300
Graphite	do	24
Lard oil	gallons	30

Mix lead with some oil, also graphite with some oil, then melt the tallow. Finally mix everything together and keep stirring until thoroughly mixed.

PUBLICATIONS ON PETROLEUM TECHNOLOGY.

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BULLETIN 155. Oil storage tanks and reservoirs, with a brief discussion of losses of oil in storage and methods of prevention, by C. P. Bowie. 1917. 73 pp., 21 pls.

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TECHNICAL PAPER 127. Hazards in handling gasoline, by G. A. Burrell. 1915. 12 pp.

TECHNICAL PAPER 131. The compressibility of natural gas at high pressures, by G. A. Burrell and I. W. Robertson. 1916. 11 pp., 2 figs.

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TECHNICAL PAPER 185. Use of the interferometer in gas analysis, by F. M. Seibert and W. C. Harpster. 1918 18 pp., 1 pl., 5 figs.

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Bulletin 183 Law Serial 20

DEPARTMENT OF THE INTERIOR
FRANKLIN K. LANE, SECRETARY
BUREAU OF MINES
VAN. H. MANNING, DIRECTOR

ABSTRACT OF CURRENT DECISIONS
ON
MINES AND MINING

REPORTED
MAY-AUGUST, 1919

BY

J. W. THOMPSON

WASHINGTON
GOVERNMENT PRINTING OFFICE
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First edition, January, 1920.

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ABSTRACTS OF CURRENT DECISIONS ON MINES AND MINING, MAY-AUGUST, 1919.

By J. W. THOMPSON.

MINERALS AND MINERAL LANDS.

MINERALS.

LIMESTONE DEPOSITS.

Limestone deposits that have not been demonstrated to be of such quality as to give them any substantial value over other limestone deposits of the same region, are not regarded as minerals.

Gray Trust Co., In re, 47 Land Decisions 18, p. 20.

OIL AS A MINERAL.

Oil is a mineral substance and its removal will greatly impair the value of the land from which it is removed.

Texas & Pacific Coal & Oil Co. v. Howard. ——— Tex. Civ. App. ———, 212 Southwestern 735, p. 737.

OIL AND GAS AS MINERALS—OWNERSHIP.

Oil and gas are minerals and so long as they remain in place they belong to the owner of the land under which they are found and such owner has the right to explore for the oil and gas on or under his land and when found to remove and possess the same.

Kimbley v. Luckey, ——— Okla. ———, 179 Pacific 928, p. 931.

OWNERSHIP OF MINERALS—LACHES NO BAR.

The owner of minerals in land can not be barred by laches for failing to assert his ownership where his title had not been questioned and his right invaded. No lapse of time bars one's right to property and it is only in case his right has been invaded that it can be barred by laches.

Morse v. Smythe, 255 Federal 981, p. 984.

ORE CONCENTRATION—CONSTRUCTION OF PATENT—PROCESS AND NOT RESULT PATENTED.

The court is concerned only with the five "fractions of one per cent claims," Nos. 1, 2, 3, 4, and 12, and the question presented relates only to the use of petroleum products, and are considered with respect to the amount and character of the oil prescribed. The first three claims declare that, so far as oil is concerned, the discovery consists in "adding a small proportion of an oily liquid having a preferential affinity for metalliferous matter amounting to a fraction of one per cent on the ore." The fourth claim differs only in substituting the word "substance" for "liquid" in the first three. The twelfth claim provides for carrying out the process "with oil in water containing a fraction of one per cent of oil on the ore." The patent therefore makes no differentiation either in the claims or in the specifications among the oils having a preferential affinity for metalliferous matter and that its disclosure to which the patentees must be limited is that when a fraction of one per cent on the ore of any such oil is used in the manner prescribed there will be produced a metal-bearing froth, the result of the process. No notice is given to the public and it is nowhere particularly pointed out in the claims that some oils, or combination of oils, having a preferential affinity for metalliferous matter are more useful than others in the process or that some may be used successfully and some not or that some are "frothing oils," a distinction not appearing in the patent, and that some are not. The patentees discovered the described process for producing the result or effect, the metal-bearing froth, but they did not invent that result or froth; their patent is on the process and it is not and can not be on the result and the scope of their right is limited to the means they have devised and described as constituting the process.

Minerals Separation v. Butte & Superior Min. Co., 39 Supreme Ct. Rep. 496, p. 500.

CONTRACT OF CONVEYANCE—INTEREST IN LAND.

A contract of conveyance conveyed the minerals, mineral solutions and liquids, naming oil, gas, coal, iron, sulphur, lignite, asphalt, lead, zinc, gold, silver, mica, kaolin, barite, acmite, okenite, clays, and artesian waters in and under a certain described tract of land with the right to enter and mine the same. This was a conveyance of the minerals named in place and was a conveyance of an interest in the land described as the minerals named were a part of the realty.

Thomason v. Upshur County, —— Tex. Civ. App. ——, 211 Southwestern 325, p. 327.

CONVEYANCE BY COUNTY OFFICER—VALIDITY.

The commissioner's court of a county in Texas has no power to sell and convey the minerals in lands belonging to the county to a third person for a nominal consideration, and the development of the mineral resources of the land and the payment to the county of a certain per centum of the value of the mineral resources as might be developed. Such a contract is an attempt to convey an interest in the land for a consideration, in part at least, for other than money, thereby diverting a part of the sum from the purpose to which it was dedicated, and such a conveyance is void.

Thomason v. Upshur County, — Tex. Civ. App. —, 211 Southwestern, 325, p. 327.

ORE CONCENTRATION—SULMAN, PICARD & BALLARD PATENT—NATURE AND CONSTRUCTION.

The patentees of the Sulman, Picard & Ballard patent No. 835,120 came late into the field of ore-concentration investigation, and their discovery rests upon a prior art so fully developed that it was clear that approach was being made slowly but more and more nearly to the result which was reached by the patentees of the process in March, 1905, and their final step was not a long one. Such a patent in such a field of investigation must be construed strictly, but candidly and fairly, to give the patentees the full benefit, but not more, of the disclosure of their discovery, which is to become a part of the public stock of knowledge upon the expiration of the patent period, and which was the consideration for the grant to them of a patent monopoly.

Minerals Separation v. Butte & Superior Min. Co., 39 Supreme Ct. Rep., 496, p. 499.

ORE CONCENTRATION—PATENT—CONSTRUCTION AND LIMITATION.

The courts have no right to enlarge a patent beyond the scope of its claim as allowed by the Patent Office. As patents are procured ex parte the public is not bound by them, but the patentees are; and they can not show that their invention is broader than the terms of their claims, or, if broader, they must be held to have surrendered the surplus to the public. The claim is a statutory requirement prescribed for the very purpose of making the patentee define precisely what his invention is, and it is unjust to the public, as well as an evasion of the law, to construe a patent in a manner different from the plain import of its terms.

Minerals Separation v. Butte & Superior Min. Co., 39 Supreme Ct. Rep., 496, p. 499.

ORE CONCENTRATION—SULMAN, PICARD & BALLARD PATENT—USE OF OIL—SUBSTANCES AND QUANTITY.

The only disclosure as to the kind and amount of oil which the patentees in the Sulman, Picard & Ballard patent No. 835,120 made to the public as necessary to the purpose of their process is that it must be an oil or oily substance or oily liquid having a "preferential affinity for metalliferous matter," and that it shall be "limited in amount to a fraction of 1 per cent on the ore."

Minerals Separation v. Butte & Superior Min. Co., 39 Supreme Ct. Rep., 496, p. 500.

ORE CONCENTRATION—DIFFERENT OILS IN COMPOUND.

Petroleum products within the Sulman, Picard & Ballard patent No. 835,120, for process of ore concentration, are oils having a preferential affinity for metalliferous matter. It can not be assumed as against the admission of the patentees that 12 per cent of kerosene oil and 70 per cent of fuel oil were added to 18 per cent of pine oil in the preparation of a compound used in ore concentration solely to carry the content of oil beyond the prescribed fraction of 1 per cent on the ore for the purpose of technically avoiding infringement.

Minerals Separation v. Butte & Superior Min. Co., 39 Supreme Ct. Rep. 496, p. 498.

ORE CONCENTRATION—PER CENT OF OIL USED.

The use in the concentration of ores of a mixture made up of 18 per cent of pine oil, and the remainder of petroleum products or derivatives—12 per cent of kerosene and 70 per cent of fuel oil—and by the use of 30 pounds of this combination to a ton of ore, which would be 0.01$\frac{5}{10}$ on the ore, does not infringe the claims of the Sulman, Picard & Ballard patent No. 835,120, which limits the oil to be used to a fraction of 1 per cent on the ore.

Minerals Separation v. Butte & Superior Min. Co., 39 Supreme Ct. Rep. 496, p. 497.

ORE CONCENTRATION—VARIATION OF ORE AND OILS—CERTAINTY OF PATENT.

The specifications of the Sulman, Picard & Ballard patent No. 835,120 point out that the proportion of mineral which flows in the form of froth varies with different ores and with different oily substances used, and simple preliminary tests are necessary to determine what oily substance will yield the best results with each ore. But such variation of treatment must be within the scope of the claims of the patent, and the certainty which the law requires in patents is not greater than is reasonable having regard to their subject matter. The process is one for dealing with a large class of substances, and the range of treatment within the terms of the claims, while leaving something to the skill of the persons applying the invention, is sufficiently definite to guide persons skilled in the art to its successful application, and this satisfies the law.

Minerals Separation v. Butte & Superior Min. Co., 39 Supreme Ct. Rep. 496, p. 497.

ORE CONCENTRATION—INFRINGEMENT OF PATENT.

This case involves the validity of the Sulman, Picard & Ballard patent No. 835120 and an infringement thereof by the Butte & Superior Mining Co. The chief controversy centered about the claim of infringement based upon the use of oil by the mining company in excess of 1 per cent on the weight of the ore. The patent relates to improvements in the concentration of ores, the object being to separate metalliferous minerals, graphites, and the like from gangue by means of oil, fatty acids, or other substances which have a preferential affinity for metalliferous matter over gangue. The patentees under a patent may claim a reasonable degree of variation within the terms of the claims 1, 2, 3, 4, and 12, in the amount of oil to be used and the application of their discovery in practice, and the restricting of the amount to a fraction of 1 per cent on the ore was reasonable and lawful.

Minerals Separation v. Butte & Superior Min. Co., 39 Supreme Ct. Rep., 496, p. 497.

ORE CONCENTRATION—INFRINGEMENT—PER CENT OF OIL USED.

The Sulman, Picard & Ballard patent No. 835120 for process of ore concentration in claims Nos. 1, 2, 3, 4, and 12 has "fractions of 1 per cent claims," and extends to and covers the use in the process of oil in amounts equal to any fraction of 1 per cent on the ore.

Minerals Separation v. Butte & Superior Min. Co., 39 Supreme Ct. Rep., 496, p. 497.

See Minerals Separation v. Hyde, 207 Federal 956.
Minerals Separation v. Miami Copper Co., 237 Federal 609.
Minerals Separation v. Miami Copper Co., 244 Federal 752.
Minerals Separation v. Hyde, 242 U. S. 261, 37 Supreme Ct. Rep. 82.
Minerals Separation v. Hyde, 245 Federal 577, 250 Federal 241.

MINERAL LANDS—SALE AND CONVEYANCE.

DEED CONVEYING MINERAL—EXTENT OF RIGHT CONVEYED.

A grantor by deed conveyed all his interest in a certain described tract of land excepting the part or tract he had previously sold by written contract. This grant was sufficient to convey the mineral rights of the grantor in the portion of the tract described which he had previously contracted to sell to another but in which he had reserved the mineral rights.

Morse v. Smythe, 255 Federal 981, p. 982.

DEED RESERVING MINERALS—CONSTRUCTION.

A deed for certain described lands reserved and excepted therefrom the subterranean oil and minerals and the right to enter upon the lands to dig, bore, or mine for such minerals, paying to the grantees such damages as they might sustain by reason of such entry. The grantees upon the same day mortgaged to the grantor the land conveyed to secure the payment of a note thereafter to become due. Before the maturity of the note, the grantor executed to the grantees a quitclaim deed, referring to the mortgage and reciting that, whereas the grantees are desirous of having the land relieved from the operation of the mortgage and in consideration of the premises and the sum of $1, he "remised, released, and forever quitclaimed to the grantees by name the aforesaid premises, and all the right, title, and interest, both in law and in equity which I have in and to the same." This instrument or quitclaim uses language necessary to convey both the legal and equitable interest of the owner and the parties so construed it, and this construction was not challenged for nearly 50 years. The grantor lived 21 years after the execution of this quitclaim, and during that period the grantees dealt with the property in all respects as their own. Before the grantor's death a purchaser of a part of the land from the grantees leased a part of the land for the express purpose of drilling, digging, boring, and removing petroleum oil and similar substances. Under these circumstances the quitclaim deed released not only the mortgage but also conveyed the reserved mineral rights.

MacFarland v. Walker, ——— Cal. App. ———, 181 Pacific 288, p. 250.

DEED RESERVING MINERALS—EFFECT AND EXTENT.

A deed conveyed to the grantee the surface of certain described lands as a part of a certain known addition under a survey, reserving the coal and mineral rights. Subsequently the grantor conveyed to another all the residue of the tract of land of the designated addition according to a plat prepared by a certain named person, but not to include any land in such survey or addition theretofore conveyed. Thereafter the grantee of the last-described tract conveyed to a coal company all the coal and other minerals underlying the tract of land constituting the residue of the tract as surveyed. The deed to the grantor of the mineral rights by which was conveyed the residue of the tract in such survey did not and was not intended to convey the mineral interest theretofore reserved in the tract of the addition theretofore conveyed.

Byard Coal & Coke Co. v. Mitchell, 255 Federal 216, p. 217.

CONVEYANCE BY WARRANTY DEED—AFTER-ACQUIRED TITLE—ESTOPPEL.

A tenant in common sold and conveyed by warranty deed all the minerals, coal oil, rock carbon, or other oils, salt water, or any or all other valuable minerals except coal, under the lands of the grantor as described. At the time of the execution of the deed the grantor owned but a one-half interest in the lands described, but there was an oral agreement from the other tenant in common for an exchange of their several interests and by which the grantor was to acquire the full title to the land described and a conveyance of the other interest was subsequently made to the grantor in the deed conveying the mineral right. This subsequent title when acquired by deed enured to the grantee in the mineral deed and perfected his title as against the grantor or any subsequent conveyance made by him.

Hays v. Lackey, ——— Ky. ———, 213 Southwestern 205, p. 206.

OPTION CONTRACT TO PURCHASE—FRAUDULENT DECREE—EFFECT ON PURCHASER.

An option contract for the purchase of mineral lands was obtained pending litigation over the land but prior to the judgment. If the judgment was entered by agreement or was a fraud upon the purchaser's rights and was in fact collusive, it can not prevail over whatever rights the purchaser obtained under his option contract of purchase.

Crawford v. Williams, ——— Ga. ———, 99 Southeastern 378, p. 381.

LEASE NOT A CONVEYANCE.

A state mining lease under the statute of Minnesota is not a conveyance of ore in place but it is in fact as it is in form a lease and no more.

State v. Cavour Min. Co., ——— Min. ———, 173 Northwestern 415.
~~See State~~ v. Evans, 99 Minn. 220, 108 Northwestern 958.
Boeing v. Owsley, 122 Minn. 190, 142 Northwestern 129.
State v. Royal Mineral Ass., 132 Minn. 232, 156 Northwestern 128.
Von Baumbach v. Sargent Land Co., 242 Federal 503.
United States v. Biwabik Min. Co., 247 Federal 116, p. 124.

written contract. This grant was sufficient to convey the mineral rights of the grantor in the portion of the tract described which he had previously contracted to sell to another but in which he had reserved the mineral rights.

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  State v. Royal Mineral Ass., 132 Minn. 232, 156 Northwestern 128.
  Von Baumbach v. Sargent Land Co., 242 Federal 503.
  United States v. Biwabik Min. Co., 247 Federal 116, p. 124.

GRANTEE OF SURFACE—ESTOPPEL TO DENY GRANTOR'S TITLE.

A deed conveyed to the grantee the surface to a certain described tract of land, but reserved to the grantor the minerals therein. Under such a deed the grantee and those claiming under him are estopped to deny the title of the grantor and those claiming under him to the minerals so reserved.

Morse v. Smythe, 255 Federal 981, p. 982.

CONSIDERATION—AGREEMENT TO DEVELOP AND PAY ROYALTIES.

The owner of certain mining property conveyed for the use of the grantees the mining property described in the deed. The consideration of the conveyance was that the grantees were to take possession of the mine for the purpose of prospecting and drilling the same to the satisfaction of all the parties; and if minerals were discovered the grantees were then to work and pay a stipulated part of the net profits derived from the working of the mine. The sole consideration for the purchase price took the form of a royalty resulting from the working of the mine and there was an implied obligation on the part of the grantees to work the mine to the end that the consideration might be paid and failing in this the grantor might have the property restored to himself, and under such circumstances the grantor had the right to have the conveyance forfeited.

Sledge v. Stolz, —— Cal. App. ——, 182 Pacific 340, p. 344.

AGREEMENT TO DEVELOP—PAYMENT OF ROYALTIES—FORFEITURE.

The owner of a mining claim conveyed the same by deed to a grantee under an agreement that the grantee was to perform the assessment work and to prospect and work the claim and to pay the grantor a certain specified per cent of the net profits derived from the working of all mineral bearing earth. The sole consideration for the deed was an agreement to develop the mining claim and the payment of royalties. The obligation to work the mine was therefore a condition of the deed and on the failure of the grantee to operate the mine and a substantial breach of such implied condition the grantor had the right to reenter and claim a forfeiture of the conveyance.

Sledge v. Stolz, —— Cal. App. ——, 182 Pacific 340, p. 344.

PARTITION—SALE—DIVISION OF PROCEEDS.

A petition for partition of mineral land by certain of the coowners alleged that the minerals were not susceptible of division in kind without impairing the value of the whole property and of the complainants' interest therein. Under the statute of Kentucky a vested estate in real property jointly owned by two or more persons may be sold by an order of a court of equity and under the code the complainants were entitled to a sale of the mineral property and a division of the proceeds according to the respective rights of the joint owners.

Kentucky Fluorspar Co. v. Pierce, —— Ky. ——, 218 Southwestern 542, p. 544.

SURFACE AND MINERALS—OWNERSHIP AND SEVERANCE.

PARTITION OF MINERAL RIGHTS—SALE.

An actual division of a mine can rarely be made without doing a possible injustice to some of the cotenants, and generally partition proceedings must result in a sale of the property and a division of the proceeds. But a sale of a mine can not be ordered in a partition suit except in cases where a partition would be manifestly injurious to the interests of the cotenants. Generally, land should be partitioned in kind unless the partition can not be made without prejudice to the owners. Where mines have not been opened a partition of land having upon it solid minerals will be decreed unless the minerals are so situated that a probable fair division of them can not be made by dividing the surface of the land. All things being equal as between a partition and a sale, partition will be decreed.

Kentucky Fluorspar Co. v. Pierce, ——— Ky. ———, 218 Southwestern 542, p. 543.

COAL AND COAL LANDS.

CONVEYANCE BEFORE PATENT—TITLE—ESTOPPEL.

A coal-land entryman, after filing his declaratory statement, conveyed the land for a valuable consideration before completing the entry. Under an agreement with the purchaser he afterwards completed the entry, obtained a patent, and delivered it to the purchaser. Under these facts the entryman was in no position to assert that there was fraud or illegality in the proceedings through which he acquired the patent and his grantee who was not an innocent purchaser for value is in no better position.

Ketchum v. Pleasant Valley Coal Co., 257 Federal 274, p. 276.

OPTION TO PURCHASE—AGREEMENT TO EXTEND—CONSIDERATION—BREACH BY VENDOR.

The owner of certain coal lands gave to another an option to purchase. Before the expiration of the option the vendor agreed to extend the option in consideration that the optionee report the drillings made on the land. Before the expiration of the extension and before the optionee had reported the drillings made the vendor gave notice that he would not abide by the option. His refusal was not based upon any failure of the optionee to perform the conditions stated, and under these facts the optionee was entitled to specific performance without a strict compliance with the conditions on which the extension of the option was made.

Starr v. Crenshaw, ——— Mo. ———, 213 Southwestern 811, p. 815.

OPTION TO PURCHASE COAL LANDS—CONSIDERATION FOR EXTENSION.

The owner of certain coal land gave to another an option to purchase the same, the option to extend to a certain date. Subsequently the owner agreed to extend the option for a year on condition the optionee give him a certified report of the drillings made upon the coal lands, and that the optionee pay interest on all deferred payments from a certain date in the event that he exercised the option. These conditions when substantially performed constituted a sufficient consideration for the extension of the option, and the owner could not then withdraw the option before the expiration of the extended time.

Starr v. Crenshaw, ——— Mo. ———, 213 Southwestern 811, p. 814.

RIGHT TO MINE—EASEMENT—FAILURE TO EXERCISE.

There may be an extinguishment of an easement to mine coal in place by an actual abandonment continuing for upward of 33 years.

McClure v. Monongahela Southern Land Co., —— Pa. ——, 107 Atlantic 386, p. 387.

EASEMENT TO MINE COAL NOT REVIVED ON SEPARATION OF ESTATES.

Where an easement to mine and remove coal in place had been abandoned by the original owner of the right, the subsequent separation of the ownership of the estates did not revive the easement previously extinguished.

McClure v. Monongahela Southern Land Co., —— Pa. ——, 107 Atlantic 386, p. 388.

UNION OF DOMINANT AND SERVIENT ESTATES—EXTINGUISHMENT OF EASEMENT.

The merger of a dominant and servient estates extinguishes an easement to mine and remove coal in place.

McClure v. Monongahela Southern Land Co., —— Pa. ——, 107 Atlantic 386, p. 388.

OIL AND OIL LANDS.

NATURE OF OIL AND GAS.

The fact that oil and gas are vagrant and transitory in their nature does not prevent them from adhering to and becoming part of the land while passing from one tract to another. Oil and gas while in a tract of land are a part thereof and belong to the owner of the land until they escape therefrom, but if brought to the surface and reduced to possession before such escape, they become the personal property of the owner of the land.

Kimbley v. Luckey, —— Okla. ——, 179 Pacific 928, p. 931.

PREVENTION OF WASTE—AUTHORITY OF CHIEF MINE INSPECTOR.

The constitution of Oklahoma does not expressly or by necessary implication confer upon the chief mine inspector jurisdiction to enforce the act of 1915 (Session Laws, 1915, Chs. 25 and 197), enacted to conserve and prevent the waste of crude oil and natural gas and to regulate the equitable taking of oil and gas from a common source of supply and the equitable purchase of natural gas by common purchasers thereof. The constitution does not impose any duties in relation to either of such acts to be performed exclusively by the chief mine inspector.

Love v. Boyd, —— Okla. ——, 180 Pacific 705, p. 708.

CONTRACT OF SALE—SPECIFIC PERFORMANCE—DEED OF CORPORATION.

A vendee under a contract for the purchase of oil and gas lands brought suit for specific performance. In order to justify the appointment of a special receiver for the purpose of operating an oil well on the property the plaintiff must show a clear right to the property itself. But the proof is sufficient where the conveyance was by the deed of a corporation executed and delivered by its president and secretary in due form, as it will be presumed that the officers had authority to execute the deed.

Lawrence v. Montgomery Gas Co., —— W. Va., ——, 99 Southeastern 496, p. 499.

CONVEYANCE OF PART OF LEASED LANDS.

An oil lease covering a tract of land extended its conditions and agreements to the "heirs, executors, administrators, successors, and assigns of both parties." This implied that the leased lands might be subdivided. On the purchase of a portion of the leased premises by a third person before the production of oil or gas thereon, each owner was entitled to the profits and royalties arising and accruing from the oil and gas produced on his tract free of any claim or demand of the others.

Kimbley v. Luckey, —— Okla. ——, 179 Pacific 928, p. 931.

SALE—CONVEYANCE WITH WARRANTY—EFFECT ON OIL AND GAS.

The statute of Oklahoma (Revised Laws, Sec. 1162), provides that a warranty deed made in substantial compliance with the statute shall convey to the grantee the whole interest of the grantor in the premises described and this includes the right to oil and natural gas that may be found underneath the premises granted or by drilling thereunder.

Kimbley v. Luckey, —— Okla. ——, 179 Pacific 928, p. 930.

PURCHASE—INADEQUACY OF PRICE—TIME FOR FIXING VALUE.

The proper time for judging of the value of land as to the inadequacy of the price to be paid was when the purchaser or lender was considering whether to invest his money, and not after it had acquired a value of $100,000 as a result of the discovery of oil.

Butler v. Marston, 145 La. ——, 81 Southern 749, p. 751.

RESERVATION OF OIL—IMPLIED COVENANT TO DEVELOP.

A contract was entered into by which the contractor was to obtain title in his name to 1,600 acres of land within a certain section, title to remain in the contractor until the contract was completely performed. When title was obtained the contractor agreed to execute and deliver to the contractee an oil and gas lease on 500 acres of the land for a period of fifteen years or so long as oil or gas was produced from the premises. Other contracts were entered into and conveyances made by which the title to the land was more or less involved. By a subsequent contract for the purpose of adjusting the respective rights of the parties in the land and to enable the original contractor to obtain a merchantable title to the fee, the original contractee made certain conveyances but reserved for fifteen years the oil and gas under the lands purchased. The primary purpose of this reservation was not the payment to the contractor of royalties from oil and gas to be found thereon but to adjust the respective rights of the parties in the land, and there was therefore no implied covenant to develop the premises within a reasonable time, as production and payment of royalties were not the moving considerations for the making of the contract.

Kroeger v. Martin, —— Okla. ——, 180 Pacific 955, p. 957.

PARTITION—ALLOWANCE FOR IMPROVEMENTS FOR PRODUCTION OF OIL.

In an action by cotenants for the partition of land subject to an oil lease, the cotenant in possession must account for the value of oil produced, and marketed from the premises; but the fair value of the necessary and proper permanent and lasting improvements placed upon the land to develop it for oil by the tenant in possession must be allowed to him from the funds arising from royalties of the oil sold from the entire property.

Miller v. Powers, —— Ky. ——, 212 Southwestern 453, p. 456.

PERMIT UNDER TEXAS STATUTE—SURVEY.

The statute of Texas (General Laws 1913, chap. 173) authorizes the land commissioner to issue permits to prospect for oil and gas upon "surveyed lands." Where an application was made for a permit as to a certain designated area and the land commissioner caused the area to be surveyed, but the applicant failed to complete his application, a second permit on proper application for the same lands may be issued without a resurvey, as the lands were then "surveyed lands" within the meaning of the statute. Under these facts a third applicant could not compel the land commissioner by mandamus to issue to him a permit on the same area.

Sibley v. Robison, —— Tex. Civ. App. ——, 212 Southwestern 932, p. 933.

PROMISE TO PROSPECT—SURVEYED LANDS.

On an application for a permit under the act of 1913 to prospect for oil and gas upon land belonging to the State the area was lawfully surveyed and the field notes duly filed in the Land Office, but no permit was issued at the time. Subsequently an application was made and the area was treated as surveyed land within the meaning of the statute. A resurvey of the area was not required, and, as the permit was lawfully issued and was filed, the land commissioner could not be compelled by mandamus to issue another permit on the same surveyed area.

Sibley v. Robison, —— Tex. Civ. App. ——, 212 Southwestern 932, p. 933.

LEAKING OIL—ABATABLE NUISANCE—DAMAGES.

Oil escaping from a pipe line flowed over the complainant's lands, destroying the grass and vegetation and killing his live stock. The evidence showed an injury to the products of the soil by a continuing abatable nuisance and damages can be recovered only to the date of the action, as the presumption is that the cause producing the injury will be removed by an abatement of the nuisance. If the nuisance is not abated, it is continuous, resulting in damages, is a new and separate injury, which gives rise to a new cause of action and successive actions may be maintained so long as the nuisance is permitted. The measure of damages in such an action is the depreciation in the rental value of the real estate affected.

Indiana Pipe Line Co. v. Christensen, —— Ind. ——, 123 Northeastern 789, p. 790.

OIL—DAMAGES FOR INJURIES—SINGLE ACTION.

In an action by a landowner for damages resulting from his land being flooded with oil that escaped from a pipe line, the evidence showed that crude oil has a harmful effect on certain things and that it will kill vegetation; that the crops growing on the land were injured and that stock of the landowner was injured and some killed as a result of oil swallowed in eating grass and drinking water. In such an action the recovery must be limited to damages resulting to the land from the oil permitted to flow thereon prior to the commencement of the action, and the entire damages must be recovered in a single action, as the wrongful act could not be treated as a continuing nuisance.

Indiana Pipe Line Co. v. Christensen, —— Ind. ——, 123 Northeastern 789, p. 793.

OIL INSPECTION.

AUTHORITY TO ADMINISTER INSPECTION LAW.

The authority and duties in reference to the inspection of oils and liquid products of petroleum manufactured or offered for sale for illuminating, heating, and power purposes, the conservation of oil and gas, drilling and operating oil and gas wells, and plugging abandoned wells, are, under the act of 1917 (Session Laws, 1917, ch. 207), under the jurisdiction and supervision of the Corporation Commission and the duly appointed and acting oil and gas conservation agent in charge of the oil and gas department of the Commission.

Love v. Boyle, —— Okla. ——, 180 Pacific 705, p. 709.

INSPECTION AND TEST—STATUTE REGULATING.

Section 2505 (Iowa Code Supp. 1913), fixes 100 degrees flash test as the standard for illuminating oil. Section 2508 of the same statute fixes the standard at 105 degrees thus making a clear conflict between the provisions of the two sections. These sections were carried into the code supplement from prior statutes but the act of 1911 amended section 2505 by striking out the test figures 105 degrees and inserting in lieu thereof the figures 100 degrees. Section 2505 is therefore the later enactment and must control and an inspector is required to approve and so brand oil meeting the 100-degree test. The brand of approval has no function except as a declaration that the oil met the legal standard.

Way v. S. L. Collins Oil Co., —— Iowa ——, 173 Northwestern 20, p. 22.

STATE INSPECTION LAWS—CONSTRUCTION AND VALIDITY.

A State may pass proper inspection laws for oils brought into its borders in interstate commerce. But a State may not impose burdens upon interstate commerce in the matter of oil inspection.

Standard Oil Co. v Graves, —— Wash. ——, 39 Supreme Ct. Rep. 320, p. 321.

STATE LAWS—CONSTRUCTION AND VALIDITY.

The Washington oil inspection law (Laws, 1905, p. 310) and the amendatory acts authorized an inspection of all oils and other volatile products of petroleum shipped into that State by a State officer and provided a schedule of fees to be paid for the inspection. Under this act from 1905 to 1914 the receipts from the inspection of oil shipped into the State amounted to $335,776.30. The total cost of the inspection was $80,103.37, leaving a net revenue to the State over and above the expenses of administering the act during such years of $255,672.93. A State can not impose burdens upon interstate commerce, and if the inspection fees imposed are disproportionate to the services rendered, or if they include the cost of something beyond legitimate inspection to determine the quality and condition of oil, the act must be declared void, because such costs by necessary operation obstruct the freedom of commerce among the States. The inspection fees required by the act to be paid before an importer could sell his importation, as shown by the revenue yielded, were grossly in excess of the cost of inspection and to the extent to make the act in conflict with the Federal Constitution.

Standard Oil Co. v. Graves, —— Wash. ——, 39 Supreme Ct. Rep. 320, p. 321.
See Pure Oil Co. v. Minnesota, 248 U. S. 158, 39 Supreme Ct. Rep. 35.
General Oil Co. v. Crane, 209 U. S. 211, 28 Supreme Ct. Rep. 475.
Bartels-Northern Oil Co. v. Jackman, 29 N. Dak. 236, 150 Northwestern 576.
Castle v. Mason, 91 Ohio State 296, 110 Northeastern 463.

CORPORATION COMMISSION—POWERS AND DUTIES.

There is nothing in the constitution of Oklahoma requiring that the duties imposed on the Corporation Commission by the act of 1915

(Session Laws 1915, Chaps. 25 and 197), should be performed by the chief mine inspector and there is nothing therein which limits the power of the legislature to transfer the other duties originally imposed by statute on the office of inspector of mines, oil and gas, to some agency of the State.

Love v. Boyle, —— Okla. ——, 180 Pacific 705, p. 711.

TRANSFER OF AUTHORITY AND DUTY.

The constitution of Oklahoma (Art. 25, Sec. 13), imposed the duties of territorial oil inspector on the chief mine inspector only until otherwise provided by law. There is no express or implied constitutional limitation on the power of the legislature to take from the chief mine inspector and transfer to some other officer or department the jurisdiction and duty to inspect oils and other liquid products of petroleum known as burning oil or kerosene or gasoline manufactured or offered for sale for illuminating, heating, and power purposes.

Love v. Boyle, —— Okla. ——, 180 Pacific 705, p. 710.

SUPERVISOR OF OIL INSPECTION—APPOINTMENT.

The Legislature of Indiana has power to create the office of State supervisor of oil inspection and a person duly appointed and in possession of the office is entitled to enjoin another person from interfering with the duties of the office until such person has established his title in an action at law.

Felker v. Caldwell, —— Ind. ——, 123 Northeastern 794, p. 795.

INSPECTION AND CONTROL—TRANSFER TO CORPORATION COMMISSION.

The statute of Oklahoma (Session Laws 1917, p. 385), takes the jurisdiction and duty to inspect oil and liquid products of petroleum from the chief mine inspector and confers that power upon the Corporation Commission. The commission, with the approval of the governor, was authorized to appoint oil inspectors to perform the duties of inspection. The act authorizes the Corporation Commission to create and establish an oil and gas department under its jurisdiction and supervision, with the consent of the governor, to appoint a chief oil and gas conservation agent who shall have charge of the oil and gas department. The authority theretofore conferred upon other departments in reference to the conservation of oil and gas and control and operation of oil and gas wells and the construction and regulation of oil and gas pipe lines was conferred exclusively upon the Corporation Commission. The duty of supervising and plugging dry and abandoned oil and gas wells was taken from the chief mine inspector and given to the Corporation Commission under regulations to be made by it.

Love v. Boyle, —— Okla. ——, 180 Pacific 705, p. 707.

INSPECTION—PROOF OF TEST.

In an action by a wife against a dealer in kerosene for damages for injuries caused by an explosion of kerosene proof of tests made by a competent person is admissible and it was competent to prove that the husband of the injured plaintiff furnished the sample of the kerosene to be tested and informed the person making the test that it was from the same stock or can as was the kerosene that exploded.

Way v. S. L. Collins Oil Co., —— Iowa ——, 173 Northwestern 20, p. 22.

NATURAL GAS.

DUTY TO SUPPLY GAS—PAYMENT IN ADVANCE—REGULATIONS.

A natural gas company supplying the citizens of a city or district with gas was required to supply all patrons without partiality or discrimination and may enforce a regulation requiring payments in advance in reasonable amounts or require deposits of security. The general rule is that public service corporations furnishing gas or other public service may require that charges shall be paid for a reasonable term in advance.

Collins v. Miami County Gas Co., —— Kan. ——, 180 Pacific 769, p. 770.

CONTRACTS TO SUPPLY—CANCELLATION PROCURED BY FRAUD—LIABILITY.

A natural-gas company entered into a contract with a roofing-tile manufacturer by which it agreed to supply the manufacturer with gas for all purposes in the operation of his plant at 3 cents a thousand cubic feet for a stated term and 4 cents for an additional term. After supplying the gas under its contract for something over two years the company entered into a conspiracy with another natural-gas company to fraudulently represent to the manufacturer, in order to induce him to cancel the contract, that the supply of gas had failed, thereby inducing the signing of a new contract at 7 cents per thousand cubic feet subject to cancellation on 30 days' notice. While operating under this second contract the supply of gas was intentionally kept inadequate by the company fraudulently keeping in the supply line a cock partly closed, the scheme being to compel the manufacturer to pay the domestic rate of 20 cents a thousand. The manufacturer, in order to obtain gas for his factory, was finally compelled to pay the domestic rate of twenty cents per thousand cubic feet. On the discovery of the fraud in an action for damages by the manufacturer, the gas company was held liable for the differences between the original contract price and the amounts paid by the manufacturer under the two subsequent contracts procured by reason of the fraud.

Ludowici-Celadon Co. v. Coffeyville Gas & Fuel Co., —— Kan. ——, 180 Pacific 190, p. 191.

WASTE PREVENTED—STATUTORY REGULATIONS.

The Act of 1915 (Session Laws 1915, p. 398), makes unlawful the production of natural gas in such manner and under such conditions as to constitute waste, defines waste, and provides that when natural gas in commercial quantities, or gas bearing stratum known to contain natural gas in such quantities is encountered in a well. it shall be confined to the original stratum until it can be produced and utilized without waste, and all such strata shall be adequately protected from infiltrating water. The act regulates the taking of natural gas when the supply is in excess of market demands and purchasers of such gas are prohibited from discriminating in favor of one producer against another or in favor of one source of supply as against another. The Corporation Commission is given authority and power to conduct hearings and make regulations for the prevention of the waste of natural gas. The act provides that nothing therein contained shall interfere with any duties imposed by law on the chief mine inspector.

Love v. Boyle, —— Okla. ——, 180 Pacific 705, p. 707.

INSTALLMENT OF METERS—DEPOSIT OF SECURITY—DISCRIMINATION.

A natural gas company may establish and enforce a rule requiring all persons who desire to have a gas meter installed to deposit a reasonable amount for the instalment of the meter. The fact that a deposit had not been required of persons who had meters installed and their premises connected with the pipe lines previously to the time the rule was established and enforced does not render the application of the rule discriminatory.

Collins v. Miami County Gas Co., —— Kan. ——, 180 Pacific 769, p. 770.

ODORLESS GAS—JUDICIAL KNOWLEDGE.

A court can take judicial notice of the common fact that natural gas in a certain field has been considered to have no odor.

Hahn v. Southwestern Gas Co., 145 La. ——, 82 Southern 199, p. 201.

INTERSTATE COMMERCE.

The transportation of natural gas from one state to another is interstate commerce.

West Virginia & Maryland Gas Co. v. Towers, —— Md. ——, 106 Atlantic 265, p. 267.

See West v. Kansas Natural Gas Co., 221 U. S. 229, 35 L. R. A. (N. S.) 1193.

NATURAL GAS—LOCAL REGULATION—ORIGINAL PACKAGE DOCTRINE.

Natural gas can not be said to be the subject of interstate commerce so as to prevent regulation by state laws where it is transported from one state to another in a high-pressure pipe line and where before reaching the consumers the pressure is reduced by regulators and it is carried through the streets of a town or city in low-pressure lines and the pressure is again reduced before it enters the private service lines of the consumers. Under such circumstances the "original package" doctrine can not apply.

West Virginia & Maryland Gas Co. v. Towers, —— Md. ——, 106 Atlantic 265, p. 268.

See State v. Flannelly, 96 Kans. 372, 152 Pacific 22.
Pennsylvania Gas. Co. In re, 184 App. Div. 556, 172 New York Supp. 1028.
Landon v. Public Utilities Comm. of Kansas, 242 Federal 658.
Landon v. Public Utilities Comm., etc., 249 U. S. 236.

OIL AND GAS WELLS.

CONTRACT FOR DRILLING—COMPLIANCE WITH CONDITIONS—RIGHTS AND LIABILITIES.

A driller by a contract was to drill an oil well 2,000 feet deep for a certain stated compensation and on failure to do so he should be entitled to no compensation. The work was to be done in a good workmanlike manner and there should be a "good, clean hole to the stated depth." The landowner was to furnish and deliver at the well site all piping necessary for the completion of the well. During the process of drilling there was a cave-in in the well and this cave-in could have been protected by the use of smaller pipe than that used and the reduction in the size of the hole. The landowner refused to furnish the smaller piping and refused to permit the reduction of the hole. There was nothing to show that this cave-in was the cause of the inability to finish the well; but the failure to complete the well and make a good, clean hole was due to the fact that a piece of pipe was stuck in the well and could not be passed and the cave-in was below the pipe that obstructed the well. The landowner was justified under the contract in refusing to furnish a smaller pipe, thereby reducing the size of the hole, and his alleged failure to furnish pipe being in no way responsible for the driller's failure to furnish a good, clean hole did not make him liable to pay the agreed compensation.

Bain v. White, 256 Federal 428, p. 433.

CONTRACT TO DRILL—"GOOD, CLEAN HOLE."

A contract to drill an oil well provided that it should be completed to the depth of 2,000 feet and "shall be a good, clean hole." When the well reached the contracted depth a piece of pipe had been left in such condition that either the withdrawal of the drill stem or the mere lapse of a short period of time would result in the hole being obstructed by the pipe. By a "good, clean hole" is not to be understood one which is free from mud, but one which is free from those things the presence of which would render the hole incapable of the uses for which it was designated. Under these circumstances when the well was tendered by the driller for measurement the conditions were such that it did not meet the requirements of the contract.

Bain v. White, 256 Federal 428, p. 432.

CONTRACT TO DRILL—BREACH—RIGHT TO DRILL NEW WELL.

A driller by contract was to drill an oil well 2,000 feet deep and to furnish the landowner a good, clean hole for a stipulated consideration, but on failure to do so was to receive no compensation. The contract gave the driller an option to use an incompleted well drilled to two-thirds of the depth but abandoned because of obstacles that could not be overcome. Under the contract the landowner was to furnish at the well all piping necessary for the completion of the well. The driller exercised his option to use the old well and did drill to the required depth but could not furnish a "good, clean hole." After much delay and after more than 18 months after the signing of the contract the driller offered to construct a new hole and complete a well as required by the contract. The landowner consented to the driller making a new hole but refused to furnish pipe for the same. Having furnished pipe for the well that was drilled, and on the failure of the driller to complete it according to contract, he could not be compelled to furnish pipe for a second well and on failure to do so to be made liable for the drilling of the unfinished well.

Bain v. White, 256 Federal 428, p. 435.

CONTRACT TO BORE OIL WELLS—CONSIDERATION—EXTRA WORK—LIABILITY.

An oil-well driller undertook to drill an oil well to a depth of 2,800 feet at $2 a foot. Under the contract and by direction of the company the well was drilled to a depth of 3,000 feet and the drilling abandoned. The driller was to furnish everything necessary to drill and complete the well except the rig, fuel, water, and casing and underreamers. In an action by the driller to recover on the contract he was held entitled to recover for 15 days' underreaming pursuant to an outside agreement for which the company had agreed to pay $30 a day.

Wolverton v. Eldorado-Harper Emperial Oil & Gas Co., —— Kan. ——, 180 Pacific 792.

CONTRACT TO DRILL WELL—ABANDONMENT BY OWNER—LIABILITY.

An oil-well driller agreed with a landowner to bore a well for the purpose of obtaining petroleum, natural oil, or gas. He was to receive $1,000 for the first 600 feet and $1 per foot for any depth thereafter not to exceed 1,600 feet. The landowner reserved the right to stop the boring and accept the well as completed at any time if water was found. The payments were not to be made until the well was cleaned out and the prescribed casing put in; but if the well was not accepted by the landowner at any point and if he should abandon it entirely the driller was to draw the casing and plug the well and payment should then be made. Under this contract the landowner had the right to accept or reject the well at any depth and if accepted it was the driller's duty to put in casing, or if abandoned it was his duty to draw the casing and plug the well. The contract did not give the landowner the right to partially abandon the well after it had reached a depth of over 1,500 feet and require the driller to plug it at a point 1,000 feet below the surface and to make it a complete well to that depth.

Clarke v. Blue Licks Springs Co., —— Ky. ——, 213 Southwestern 222, p. 224.

CONTRACT OF DRILLING—INJURY TO WELL—RECOVERY.

A driller employed to drill an oil well for one dollar per foot, and to receive $25 a day for cleaning out and any extra work done after the well was drilled, such as shooting, cleaning out, and pumping, is not to be denied a recovery under the contract because after the well was completed the oil company as the owner employed a torpedo company to shoot the well, and while preparing the shot a servant of the torpedo company negligently caused a wire to fall into the well, rendering it useless and causing its abandonment.

Gates v. Little Fay Oil Co., —— Kan. ——. 181 Pacific 570.
Gates v. Little Fay Oil Co., —— Kan. ——, 182 Pacific 184.

CONTRACT TO DRILL WELL—PROOF OF PERFORMANCE.

A contract provided that an oil well should be sunk to a depth of 2,000 feet unless a flow of oil, gas, or water was secured before that depth was reached. The contract provided that an incomplete well could be used if desired, and provided for certain compensation with the condition that if the driller failed to sink the well to a depth of 2,000 feet it should be a breach of the contract and he should be entitled to no compensation. The work was to be done in a good workmanlike manner, and the contract expressly stated that the well when completed to a depth of 2,000 feet "shall be a good clean hole." There was no provision for the measurement of the well, but there was an implied obligation that upon the completion of the work or on the claim that the work was completed the driller should make a reasonable showing of the truth of his claim. The landowner was not expected to pay the driller $19,000 for a clean hole 2,000 feet deep without some evidence that the hole was that deep and that it was clean. He was not compelled to rely upon the mere statement of the contractor. The driller understood that he was to make a delivery to the landowner of a good clean hole 2,000 feet deep and that he was to demonstrate to the landowner the depth and character of the hole before the well was to be accepted and paid for.

Bain v. White, 256 Federal 428, p. 432.

COMMON POOL—OWNERSHIP—WASTE PREVENTED.

Oil and gas is the common property of the owners of the several tracts of land above it, and one landowner may be enjoined and restrained from wasting the gas, even though his doing so was for him a useful purpose in lifting oil to the surface. The rights of the several owners of a gas field are coequal, and one owner can not exercise his own right so as to preclude his neighbor from exercising his or so as to interfere with the neighbor.

Higgins Oil & Fuel Co. v. Guaranty Oil Co., 145 La. —, 82 Southern 206, p. 212.

OWNER MAY PREVENT TAKING OIL FROM UNDER HIS LAND.

A landowner may save fugitive oil from being drawn from under the surface of his own land if he can do so by some mechanical means which does not interfere with the rights of adjoining landowners to draw off the oil under their respective lands.

Higgins Oil & Fuel Co. v. Guaranty Oil Co., 145 La. —, 82 Southern 206, p. 212.

USE OF PUMP—OWNERSHIP OF OIL.

A landowner can not contest the right of an adjoining landowner to get out of his land all of the oil he possibly can by means of a well, nor can he contest the landowner's right to use pumps in obtaining the oil from a well on his own land. There is no difference between a well and a pump, both are artificial; both cause the oil to flow from the land; and both produce that effect by creating a vacuum which the oil from adjoining lands comes into to fill. In both cases the oil flows from the adjoining land by gravity and the fact that some of the oil produced by a pump may come from adjoining land can make no difference, for in the case of a flowing well so close to the boundary line that one half of its product would to a reasonable certainty be known to be coming from the adjoining land the owner of such tract would hardly claim either the ownership of such one half of the oil or the right to close the well. The reason of this is that an owner of land does not own the fugitive oil beneath it.

Higgins Oil & Fuel Co. v. Guaranty Oil Co., 145 La. ——, 82 Southern 206, p. 211.

PERCOLATING OIL—USE OF PUMPS.

The owner of an oil well was drawing oil from it by means of a pump at the rate of 124 barrels a day. The adjoining landowner sunk a well on his land some 400 feet from the producing well which proved to be dry and was abandoned. By some underground communication air entered through the latter well in the radius affected by the pump in the first well, thereby reducing the suction and reducing the daily production of oil. The owner of the second well refused to close it and the first well owner brought suit to compel the second well owner to close the well and for damages suffered by reason of his failure to do so. In addition to the above facts the complainant averred that pumps were being used by other parties on all the adjoining tracts of land and were depleting the reservoir of oil which lies under the lands of that locality. A landowner is not bound to do anything to save the adjoining landowner from loss but he must abstain from doing anything that might cause a loss. Under the facts as averred and proved the owner of the second well was enjoined from leaving the well open to the adjoining landowner's damage, particularly so where the dry well was of no benefit to the owner. If the defendant's action was limited to preventing the oil from escaping from his land to that of the plaintiff, the plaintiff would have no good ground for complaint or for injunction; but so far as known no oil was being drawn out of the defendant's land while under the averment and the proof the defendant was directly and seriously interfering with the complainant's right to operate for oil and interfered with the taking of oil from the complainant's own land, and with no benefit to himself.

Higgins Oil & Fuel Co. v. Guaranty Oil Co., 145 La. ——, 82 Southern 206, p. 212.

OWNERSHIP OF WELL—TRANSFER OF AUTHORITY—LEGISLATIVE POWER.

The constitution does not directly or indirectly confer upon the chief mine inspector jurisdiction to enforce sections 4319, 4331 (R. S. 1910), intended to regulate the use and preservation of natural gas, drilling wells for oil and gas, piping, storage, or the purchase of the same, or to superintend the plugging of dry or abandoned oil and gas wells, or impose any duties in relation thereto to be performed exclusively by the chief mine inspector. No limitation is imposed upon the power of the legislature to transfer to some other officer or department any jurisdiction conferred, or duty imposed by statute on the chief mine inspector in relation thereto.

Love v. Boyle, —— Okla. ——, 180 Pacific 705, p. 708.

CONSERVATION COMMISSION—AUTHORITY TO TAKE POSSESSION OF GAS WELL—INJUNCTION.

The statute of Louisiana (act No. 71, of 1906) empowers the conservation commission or the department of conservation to take possession of gas wells that are wild, uncontrollable, or burning. A certain well, known as the "White" well, had for a long time been running wild and wasting gas. The Louisiana Gas & Fuel Company had a near-by well that produced enormous quantities of gas. It was believed that the latter well in some way contributed to the waste in the "White" well. A committee was appointed to investigate the conditions, and after investigation reported that the trouble with the "White" well was attributable to no defect in the well of the Louisiana Gas & Fuel Company. The company, to satisfy itself, "killed" its well and allowed it to remain dormant and unproductive for four months, discovered that during that time the "White" well remained unaffected. The conservation commission notified the Louisiana Gas & Fuel Company that it intended to take possession of the company's well and kill it entirely or permit it to blow for a satisfactory period to determine the effect on the "White" well. On a petition by the Louisiana Gas & Fuel Company and under an averment that if its well was permitted to blow 15 days it would cause a waste of 975,000,000 cubic feet of gas, destroy the well, and would materially damage the gas field in the vicinity of the gas and fuel company and that the injury to it would be irreparable, the gas and fuel company was granted an injunction restraining the conservation commission from taking possession of its well and from interfering with its possession and operation of the same. Subsequently the department of conservation obtained a counterinjunction prohibiting the Louisiana Gas & Fuel Company from interfering with it in its proceedings to take possession of the well or interfering with its operations. Under these facts the Louisiana Gas & Fuel Company was entitled to a writ of prohibition against the judge prohibiting the enforcement of the injunction obtained by the department of conservation under the rule that an injunction once issued should not be dissolved ex parte, whether the dissolution be effected by a motion to dissolve or by a counterinjunction.

Department of Conservation v. Louisiana Gas & Fuel Co., 144 La. ——, 81 Southern 454, p. 456.

INDIAN LANDS.

LEASE BY INDIAN—APPROVAL BY SECRETARY—RELATION—ESTOPPEL.

A lease executed by an Indian allottee was neither void nor voidable because the parties made and delivered it subject to the approval of the Secretary of the Interior before the term of the lease began to run. Subject to that approval the parties to the lease by its execution and delivery estopped themselves and those claiming under them with notice of the lease from denying, revoking, or avoiding it when approved by the Secretary as against the parties to it and those claiming under them with notice, and it related back to and took effect as of the date of its execution.

Anchor Oil Co. v. Gray, 257 Federal 277, p. 280.

LEASE BY HEIRS—VALIDITY—RIGHTS IN ROYALTIES.

A surviving husband and two minor children by their legal guardian, the heirs of an Indian allottee that died intestate in November, 1908, leased in 1912 the inherited homestead for oil and gas in accordance with the rules and regulations prescribed by the Secretary of the Interior. One of the minor children was born before and the other after March 4, 1906. The lease was for a term of ten years and as much longer as oil or gas were found in paying quantities and provided for the payment of stipulated royalties. The rights of the heirs among themselves was not to be altered or affected. These minerals were part of the homestead and the lease operated as a sale of them as and when they were extracted; and in that sense the heirs were exchanging a part of the homestead for money paid as royalties but no heir was surrendering any right to the other. The rights of all in the royalties were the same as in the homestead. Under the act of May 27, 1908, (35 Stats. 312), the homestead of an Indian allottee was set apart for the use and support of any children born after March 4, 1906, but not extending beyond April 26, 1931. Under this act the child born after March 4, 1906, was entitled to the use of all royalties, the interest or income that may be obtained by properly investing the same, during such time, leaving the principal as well as the homestead to go to the heirs in general on the termination of the rights of such child.

Parker v. Riley, 39 Supreme Ct. Rep. 405.
See Parker v. Richard, 39 Supreme Ct. Rep. 442.

RESTRICTED LANDS—MINING FOR OIL AND GAS—SUPERVISION BY SECRETARY.

Under the Act of 1908 (35 Stat. 312) leases were made of "restricted lands" for oil and gas mining with the approval of the Secretary of the Interior and under regulations prescribed by him. The land was then restricted and the restrictions have not since been removed, and the event which the regulations and lease provide shall terminate the supervision of the Secretary of the collection, care, and disbursement of the royalties has not occurred. Both the allottee and the heirs being full blooded Indians they are regarded by the act as in need of protection, and in the absence of some provision to the contrary the supervision naturally falls to the Secretary of the Interior. The heirs may remain owners until the restriction expires in regular course in 1931. There is nothing in the act indicating that it intended in the meantime to take from the Secretary or to commit to the courts the supervision of matters pertaining to the lease or to the royalties. The representatives of the Secretary of the Interior could not therefore be enjoined from collecting future royalties on the oil and gas lease.

Parker v. Richard, 39 Supreme Ct. Rep. 442, p. 444.

LEASE BY INDIAN ALLOTTEE—PRIORITY OVER LEASE BY HEIRS.

The only restriction on alienation by an Indian allottee and removal by the death of such allottee, were restrictions on the alienation of the right in the lands which descended to heirs upon her death, and those rights were inferior and subject to the rights of the lessees of an oil lease executed by the allottee in her life time and subsequently approved by the Secretary of the Interior. When the lease was approved as provided by law, then it became impregnable to the attacks of the heirs and persons claiming under them with notice of the prior lease.

Anchor Oil Co. v. Gray, 257 Federal 277, p. 280.

OIL LEASE—RESTRICTIONS ON ALIENATION.

The restrictions imposed by statute upon alienation of land by an Indian allottee could only be removed by the approval of an oil lease by the Secretary of the Interior. The death of the allottee, the lessor, before the approval of the lease did not remove but perpetuated the restriction on the alienation of the land, and after the death of the lessor the only act which the lessor had done by which the land could be alienated was the execution of the lease and the alienation by that lease was restricted and it could have effect only when approved by the Secretary. Therefore, a condition in the lease on which it was to take effect was never fulfilled and the lease never became operative.

Anchor Oil Co. v. Gray, 257 Federal 277, p. 289.

OIL AND GAS LEASE—DEATH OF ALLOTTEE—RESTRICTIONS UPON ALIENATION.

The Act of May 27, 1908 (35 Stats. 315), provides that the death of an allottee of the Five Civilized Tribes shall operate to remove all restrictions upon the alienation of the lands of any allottee, but under the act a conveyance shall be approved by the proper court. This act is prospective and not retrospective in effect and applies to leases made after its passage and can not apply to a lease made by a full-blooded Creek allottee before its passage.

Anchor Oil Co. v. Gray, 257 Federal 277, p. 279.

OIL LEASE—APPROVAL AFTER DEATH OF ALLOTTEE.

The Act of April 26, 1906 (34 Stats. 137, p. 145), authorizes the Secretary of the Interior to approve and thereby to perfect oil and gas mining leases of allotments by full-blooded allottees of the Creek Indians. This authority does not cease at the death of the allottee by reason of the provisions of the Act of May 27, 1908 (35 Stats. 315); but the Secretary may approve and validate such a lease after the death of the allottee, the lessor.

Anchor Oil Co. v. Gray, 257 Federal 277, p. 279.

PUBLIC LANDS.

WITHDRAWAL—PICKETT ACT—CONSTRUCTION.

The Pickett Act (Act June 25, 1910, 36 Stat. 847, Compiled Stats., secs. 4523–4525), is a remedial statute and should be liberally construed to protect bona fide occupants of public oil or gas lands who in good faith were at the date of a withdrawal engaged in work leading to discovery by giving them the right to continue their work to a discovery and thereafter to extract and market the oil and to acquire title notwithstanding the withdrawal. It is of no consequence from whom the occupants obtained possession if they were at the date of withdrawal claiming in their own right no more land than they would be entitled to take under the mining laws and were acting in good faith and with an honest purpose to comply with the law.

United States v. Rock Oil Co., 257 Federal 331, p. 333.
See Consolidated Mutual Oil Co. v. United States, 245 Federal 521.

EMINENT DOMAIN.

RIGHT OF WAY OVER MINING CLAIM.

A railroad right of way across a mining claim in a national forest is superior to the right of a claimant who held under his mining claim until the land was thrown open and who then settled and obtained patent under the homestead law.

Van Dyke v. Arizona Eastern R. Co., 248 U. S. 49, p. 52.

PIPE LINES—CANCELLATION OF DEED—RIGHTS OF PIPE LINE OWNERS.

A court may cancel a void deed purporting to grant the right to construct and maintain a pipe line on a tract of land and ascertain and decree the damages. But the damages must be limited in elements and amount to the date of acquisition of the right to occupy and use the land and do not include compensation allowed by law for rightful taking of a tract of private land for public use and injury to the residue thereof.

Given v. United Fuel Gas Co. —— W. Va. ——, 99 Southeastern 476, p. 477.

MINING CORPORATIONS.

DE FACTO CORPORATION—WHAT CONSTITUTES.

A mining corporation de facto existed where there was an attempt in good faith to comply with the statutory requirements authorizing such a corporation and where it elected corporate officers, took over a contract for the lease of a mine, and expended large sums of money in operating and developing the mine, all ostensibly as a corporation.

Grant Chrome Co. v. Marks, —— Oreg. ——, 181 Pacific 345, p. 346.
See 1 Thompson on Corporations (2d Ed.), Sec. 226.

CORPORATION DE FACTO—RIGHT TO QUESTION.

The rule is, that as between private parties, the right of a corporation de facto to act as a corporation can not be questioned.

Grant Chrome Co. v. Marks, —— Ariz. ——, 181 Pacific 345, p. 346.

CORPORATION WITHOUT CAPITAL STOCK.

A corporation without capital stock and without shares of stock is not new in corporate organization. Such corporations are as old as corporations themselves and have existed for many years in England and in this country. A foreign corporation organized without capital stock and without shares of stock can not on that ground alone, where it complies with the statute, be denied admission to do business in the State of Kansas.

North American Petroleum Co. v. Hopkins, —— Kan. —— 181 Pacific 625, p. 627.

KNOWLEDGE OF PROMOTER IMPUTED TO CORPORATION.

A mining company organized by a promoter who was its financial agent, its sole stockholder and controlling director, is chargeable with the knowledge of its promoter, stockholder, and director affecting the title of property conveyed to the corporation, and his knowledge must be imputed to the corporation organized and managed by him.

Peabody Consol. Copper Co. v. Maier, —— Ariz. ——, 181 Pacific 177, p. 179.

FOREIGN CORPORATION—RIGHT TO DO BUSINESS IN STATE.

A foreign mining corporation whose stock is without any nominal or par value may be admitted to do business in the State of Kansas.

The Charter Board of the State on application of a foreign corporation should concern itself earnestly to ascertain the capital of the applicant, the assets permanently devoted to the corporate business as a basis of its credit and upon which its hope of profits is rationally founded.

North American Petroleum Co. v. Hopkins, —— Kan. ——, 181 Pacific 625, p. 627.

AUTHORITY OF OFFICERS—PROOF.

The minutes of a board of directors of a mining corporation do not constitute the only evidence admissible for the purpose of showing authority on the part of corporate officers for the payment of corporate funds for material and supplies purchased and used on behalf of the corporation.

Fowler Gas Co. v. Weber, —— Cal. ——, 181 Pacific 663, p. 666.

AUTHORITY OF OFFICERS—ESTOPPEL.

Where a person without fraud or collusion deals with a mining company through an officer who is in the active management of the business of the company, the company will be estopped from relying upon any lack of authority in the officer as a defense against the rights of the person so dealing with him, if the act done by the officer was one which the corporation itself might do.

Hammitt v. Virginia Min. Co., —— Idaho ——, 181 Pacific 336, p. 338.

AUTHORITY OF SUPERINTENDENT.

The office of superintendent of a coal mining company implies some power to employ and discharge miners and to do such other things as under the circumstances may reasonably be required, the extent thereof depending in some degree on the way the business has been previously conducted and managed by him. Whether a particular contract falls within the implied powers of an officer of a mining company depends upon whether or not it is within the scope of the ordinary business intrusted to his management.

Rua v. Bowyer Smokeless Coal Co., —— W. Va. ——, 99 Southeastern 213, p. 217.

See Carroll-Cross Coal Co. v. Abrams Creek Coal & Coke Co., —— W. Va. ——, 98 Southeastern 148.

DEED EXECUTED BY OFFICERS—PRESUMPTION OF AUTHORITY.

Where a deed to certain mining property was executed and delivered by the president and secretary of the company authority on the part of the officers will be presumed and the burden will be cast upon the corporation to show want of such authority.

Lawrence v. Montgomery Gas Co., —— W. Va. ——, 99 Southeastern 496, p. 499.

FRAUD OF DIRECTOR AND GENERAL MANAGER.

The general manager and controlling director of a mining company obtained a judgment against the company on an indebtedness due him and on execution sale purchased the mines of the company for a small amount. After obtaining a deed for the property he leased the mines to the mining company and afterwards himself as promoter and general manager and controlling stockholder organized a new mining corporation and conveyed to it the mining property. As such general manager and controlling director of the original mining company he was charged with full knowledge of the creditors of such company and of the amount of their debts owing by it. Under these facts the succeeding corporation was chargeable with notice that the original mining company had in effect preferred its principal stockholder and general manager as a creditor to its other unsecured creditors and by means of a judgment permitted him to convert to his own use all of its assets, to the loss of its general creditors. Under these facts the property of the original debtor corporation in the hands of the successor corporation was liable for the debts of the unsecured creditors of the original mining company.

Peabody Consol. Copper Co. v. Maiser, —— Ariz. ——, 181 Pacific 177, p. 179.

CONTRACT TO DRILL—AUTHORITY OF GENERAL MANAGER.

An oil well drilling corporation was bound by a contract made by its general manager and was bound by the acts of its general manager where he entered into an agreement to drill a well and caused the well drilling equipment to be moved on the premises and employed drillers and began drilling the well.

Hinton v. D'Yarmett, —— Tex. Civ. App. ——, 212 Southwestern 518, p. 522.

AGENT AS TRUSTEE.

An officer and agent of a mining corporation acting for it entered into an agreement with a landowner that in consideration of the payment of a certain bonus the landowner would execute to the agent an oil and gas lease for certain lands. The mining company through the agent paid one-half of the bonus from its own funds and thereupon the landowner executed the lease as agreed upon to the agent. The mining company pursuant to the arrangement entered upon the premises and expended a large amount of money in developing the lease. The mining company could not compel the landowner to execute to it a second lease on the payment or tender of the balance of the bonus but it was entitled to all the privileges and benefits of the lease and the agent held the lease as trustee in trust for the benefit of the corporation.

Hibernian Petroleum Co. v. Davies, —— Cal. App. ——, 181 Pacific 836, p. 838.

STOCK SUBSCRIPTION—FRAUD—SPIRITUALISTIC REVELATIONS.

A stockholder in an oil company brought suit to recover money paid for stock on the ground of fraudulent representations as to the existence of oil under the land. One element of the fraud consisted in the fact that the defendant had represented to the complainant that spiritualistic communications had been made to the effect that there was oil under the land. Representations to the effect that spirits had revealed through a medium the existence of oil in valuable quantities beneath the lands in question must under the circumstances of the case be regarded as insufficient to form a basis for relief to the complainant.

Burchill v. Hermsmeyer, —— Tex. Civ. App. ——, 212 Southwestern 767, p. 771.

STOCKHOLDERS' MEETING—NOTICE—RATIFICATION OF CONTRACT.

The fact that a notice of a stockholders' meeting to consider the ratification of a contract for the sale of all of its property to be paid for in stock in the purchasing company, was accompanied by a letter from the president stating that the stock to be issued by the purchasing company would be distributed to the stockholders of the selling company, would not render the meeting illegal and is not a matter of which objecting stockholders can complain, where the stockholders' meeting did not decide upon the question of the distribution of the stock, but expressly declared it was not their purpose to do so. The ratification of the proposed sale and the acceptance of the stock in consideration of the sale of the property was clearly within the call.

Logie v. Mother Lode Copper Mines Co., —— Wash. ——, 179 Pacific 835, p. 839.

RECORD OF STOCKHOLDERS—TRANSFER OF STOCK.

The statute of Colorado (Section 870, R. S. 1908), requires a mining corporation as well as other corporations, to keep a stock book containing the names of all stockholders, the number of shares owned by each, and the date at which they became shareholders. On presentation of a certificate properly indorsed it is the duty of the secretary to make the proper transfer on the books and the transferee then becomes the stockholder and the company is under obligation to issue to him the certificates of stock. The corporation is not required to determine the title to the shares prior to the transfer on the books. The authority given by the power of attorney embodied in the indorsement sufficiently protects the corporation. If the person or agent presenting the shares of stock for transfer violates the instructions as to the transfer, such person or agent, and not the corporation is liable for the breach of duty.

Valley View Consol. Gold Min. Co. v. Whitehead, —— Colo. ——, 180 Pacific 737, p. 738.

Capitol Petroleum Co. v. Hauldeman, —— Colo. ——, 180 Pacific 758, p. 759.

RIGHT OF STOCKHOLDER TO STOCK CERTIFICATES.

A stockholder in a mining corporation is entitled to receive from the corporation certificates of stock representing his interest in the corporation and it is the duty of a corporation and its proper officers to issue and deliver certificates to the stockholder and to record his ownership of the shares in the stock book containing a list of the stockholders and the number of shares held by each.

Capitol Petroleum Co. v. Hauldeman, —— Colo. ——, 180 Pacific 758, p. 759.

SALE OF MINING STOCK—"SPECULATIVE SECURITY"—VIOLATION OF "BLUE SKY" LAW.

The statute of North Dakota, (Laws 1915, Chap. 91), makes it unlawful for any person to sell or offer for sale any speculative securities without obtaining the proper authority to make the sales. The term "speculative securities" means securities into the specific par value of which the element of chance, speculative profits or possible loss equal or predominate over the element of reasonable certainty, safety and investment. Under this statute a criminal complaint is sufficient where it charged that a certain named person wilfully, unlawfully and feloniously and without having complied with the provisions of the statute, sold an agreement for buyer's certificates of the Lignite Consumers' Mining Company of North Dakota, and where it sufficiently appeared that the certificate was to be issued in the future and by a corporation to be organized in the future and the mines from which coal was to be sold were to be developed in the future.

State v. Welch, —— N. Dak. ——, 172 Northwestern 234.

SALE OF STOCK—AGREEMENT TO RECONVEY—PAROL PROOF.

Where a sale of mining stock was accompanied by an unconditional agreement to reconvey the stock upon the payment of the indebtedness for which the stock was transferred such a condition as a matter of defeasance can be established by parol.

Kleinecke v. North Confidence Min. & Dev. Co., —— Cal. App. ——, 182 Pacific 313, p. 315.

SALE OF STOCK BY AGENT—LIABILITY.

A mining company acting as a stock broker in the business of buying and selling mining stocks and mining securities may be liable for the acts of its manager at a branch office though such manager did not act strictly within the terms of his employment.

Sullivan v. Evans-Morris-Whitney Co., —— Utah ——, 180 Pacific 435, p. 437.

OPTION TO PURCHASE STOCK—EXPIRATION OF TIME.

The owner of stock in a mining company gave an option to a third person to purchase the same but provided that the purchase should be made within a stated time. After the expiration of the time stated without any attempt made to take advantage of the option the optionee no longer had any claim upon the stock.

Kleinecke v. North Confidence Min. & Dev. Co., —— Cal. App. ——, 182 Pacific 313, p. 315.

STOCK EXCHANGED FOR PROPERTY—GOOD FAITH—DETERMINATION.

In the exchange of $1,000,000, the entire capital of a mining company, for certain mining claims, the fact that there was an agreement by which shares of stock of the par value of one dollar each and of the total par value of $500,000 were returned to the corporation and shortly thereafter several thousand of these shares of this stock were sold at five cents a share, was sufficient to cast grave suspicion upon the existence of any honest and intelligent belief that the mining claims were in fact worth $1,000,000. Under these circumstances, evidence was admissible as bearing on the honest belief of the corporator as to the value of the mining property and for the purpose of showing whether such belief was in fact honest and intelligent.

Hasson v. Koeberle, —— Cal. ——, 181 Pacific 387, p. 389.

STOCKHOLDER'S LIABILITY—STOCK EXCHANGED FOR MINING PROPERTY.

Where mining stock is sold for money and the purchase price is less than the par value of the stock the difference between the par value and the amount actually paid is the measure of the stockholder's liability to the creditor. But where corporate stock is issued for mining property having no generally defined value, the rule is that where the corporation and stockholders have agreed upon the given value for the property transferred such valuation is binding and conclusive unless it is fraudulent in purpose or effect. Where the parties place upon the property a valuation in excess of what they knew or believed to be its true value, this is a constructive fraud upon the creditors and the stock will be deemed paid only to the extent of the actual value of the mining property received in exchange for it.

Hasson v. Koeberle, —— Cal. ——, 181 Pacific 387, p. 388.
See Herron v. Shaw, 165 Cal. 668, 133 Pacific 488.
Harris v. Armour, 169 Cal. 787, 147 Pacific 1166.

PURCHASE OF STOCK—PROMISE TO RETURN MONEY IF OIL NOT DISCOVERED.

A stockholder in an oil company brought suit to recover money paid for stock. The stock was subscribed by the complainant on an ordinary stock subscription form. At the time of the payment a contract was entered into between the subscriber and the oil company reciting the consideration, the purpose and the application of the payment and the subscriber was given the privilege of increasing his subscription if desired. The complainant alleged that at the time of making the subscription and at the time of the payment of the money a parol promise was made to the effect that if oil was not discovered the money should be returned. The complainant also averred that the oral promise to repay the money was fraudulently made for the purpose of inducing the payment. The oral contract was not collateral to the written contract but was on the part of the promisor an agreement to do something in the future and to be the basis of a fraud the burden was on the complainant to show that the promisor did not at the time intend to fulfill the promise, but intended thereby to deceive the plaintiff and induce him to advance the money he did advance. The mere proof of the promise and the failure to repay as promised was not sufficient to establish the fraud as alleged.

Burchill v. Hermsmeyer, —— Tex. Civ. App. ——, 212 Southwestern 767, p. 769.

SHARES OF STOCK—INDORSEMENT AND TRANSFER OF CERTIFICATES.

A blank indorsement of a certificate of stock in a mining company makes the certificate transferable by delivery and the holder of the certificate by purchase, is, as against the corporation, the equitable owner of the share named therein and may lawfully write in the blank the name of any person as assignee or as attorney in fact where the certificate appointed an unnamed person to transfer the stock on the books of the corporation.

Valley View Consol. Gold Min. Co. v. Whitehead, —— Colo. ——, 180 Pacific 737, p. 738.

TRANSFER OF STOCK—EFFECT AND OWNERSHIP.

The transfer of shares of stock on the books of a corporation perfects the title of the holder of a certificate issued on such transfer and he becomes the legal and equitable owner of the shares of the stock. The transfer is made, not by the corporation, but by the owner of the shares or his attorney.

Valley View Consol. Gold Min. Co. v. Whitehead, —— Colo. ——, 180 Pacific 737, p. 738.

TRANSFER OF STOCK—MANDAMUS TO COMPEL.

A stockholder in a mining corporation is entitled to receive from the corporation certificates of stock representing the interest held or owned by the stockholder, and on refusal of the officers of the corporation to make a proper transfer of the stock and to issue to the stockholder the certificates to which he is entitled, the holder is entitled to a writ of mandamus to compel the corporation and its officers to make the proper transfer upon the books of the company and to issue the proper certificates therefor. The holder of such stock has no adequate remedy at law because of the uncertain value of such stock and the possibilities of sudden increase in value.

Capital Petroleum Co. v. Hauldeman, — Okla. —, 180 Pacific 758, p. 759.

PLEDGE OF STOCK AS SECURITY—PURCHASER WITH NOTICE.

The owner of stock in a corporation pledged it to a corporation to secure advancements made by it to another corporation in which the pledgor was interested. The pledgee subsequently deposited the stock with a bank as collateral security for its indebtedness to the bank. This debtor corporation afterward became bankrupt and the stock was sold to satisfy the debt and one of the active managing officers of the bankrupt corporation with full knowledge of all the facts purchased the stock. The purchaser under such circumstances could not hold the stock as against the original owner and pledgor after all advancements for which the stock was originally deposited as security had been paid.

Kay v. Piney Coal & Coke Co., —— W. Va. ——, 99 Southeastern 501.

SALE OF PROPERTY—PAYMENT IN STOCK.

A mining company whose charter authorized it to acquire and sell real estate and also to purchase and own stock in other corporations has a right to sell all of its property and to accept stock of another corporation in payment for the property sold.

Logie v. Mother Lode Copper Mines Co., —— Wash. ——, 179 Pacific 835, p. 838.

See Butler v. New Keystone Min. Co., 10 Delaware Chanc. 331, 93 Atlantic 380.
Sraber v. Lucas Prospecting Co., 124 Iowa 107, 99 Northwestern 290.

SALE OF PROPERTY—CONSIDERATION—DEVELOPMENT OF MINING PROPERTY.

The sale by a mining corporation of all its property and the acceptance of stock in another mining company is not wanting in consideration because of the existence of an executory contract for the development of the mining property and transportation facilities on the part of the company owning such stock, as conditions of an executory contract to be performed in the future are no less a consideration for the present transfer of property because they rest in part upon the faith that they will be kept and performed by the promissor. In case of a failure of the consideration, the injured party is not without a remedy.

Logie v. Mother Lode Copper Mines Co., —— Wash. ——, 179 Pacific 835, p. 838.

POWER TO SELL PROPERTY—RIGHTS OF MINORITY STOCKHOLDERS.

A mining corporation whose articles of incorporation gave it power to purchase and acquire real estate and alienate the same in whole or in part, may sell any or all of its property notwithstanding the dissent of minority stockholders.

Logie v. Mother Lode Copper Mines Co., ——, Wash. ——, 179 Pacific 835, p. 837.

See Parsons v. Tacoma Smelting & Refining Co., 22 Wash. 492, 65 Pacific 765.
Pitcher v. Lone Pine-Surprise Consol. Min. Co., 39 Wash. 608, 81 Pacific 1047.
Smith v. Flathead River Coal Co., 66 Wash. 408, 199 Pacific 858.

TRANSFER OF PROPERTY—PROPERTY HELD IN TRUST.

A creditor recovers a judgment against a mining company for goods and merchandise sold the company and an order of sale for certain mines formerly the property of the company but then in the possession of another mining company as the successor and the present owner of the assets of the original mining company and as successor to the corporate franchises, rights and liabilities of the original company. The mines in the posession of the successor of the original debtor corporation were subject to the judgment of the creditor of the original corporation on the theory that the succeeding corporation through its promoter who was its sole stockholder and controlling director had knowledge of the indebtedness and that the transfer of the property was for the purpose of avoiding the payment of the debts of the mining corporation.

Peabody Consol. Copper Co. v. Maier, —— Ariz. ——, 181 Pacific 177, p. 179.

LOAN TO PRESIDENT—LIABILITY OF CORPORATION.

The president of a mining company procured a loan and gave the note of the corporation secured by a mortgage on the land of the corporation. The lender had notice that the loan was in fact for the personal use of the president and was received by him and so used. Under these facts the lender could not enforce the mortgage against the property of the mining company.

Gross Iron Co. v. Paulle, —— Minn. ——, 172 Northwestern 907.

PURCHASE OF LEASES—NOTICE OF PARTNERSHIP.

An oil and gas company purchasing leases from a firm was charged with knowledge that the concern was a partnership and was operating under a fictitious name. The purchasing corporation was also presumed to have been acquainted with the statutes of the State and that a failure of a partnership to comply with statutory requirements would render its contracts unenforceable.

Warren Oil & Gas. Co. v. Gardner, —— Ky. ——, 212 Southwestern 456, p. 457.

OWNERSHIP OF LAND—TIMBER HELD IN TRUST.

The Houston Oil Company was organized to pay for and take title to certain lands. It appearing doubtful whether an oil company had a right to hold timber lands a lumber company was organized to hold the timber in trust for the oil company, but the price of the timber was paid by the oil company. This was sufficient to vest the title in the oil company.

Keith Lumber Co. v. Houston Oil Co., 257 Federal 1, p. 6.

LIABILITY FOR NEGLIGENCE OF SERVANT.

An oil company engaged in selling oil and gasoline furnished its manager in charge with an automobile for use in the discharge of his duties. The manager was prohibited from using the company's car except during business hours in the transaction of company business. The manager on a particular day worked with an assistant until 10 o'clock at night in preparing an invoice of the stock belonging to the company that was required to be mailed to reach the company's office by the end of the month. The invoice was finished at 10 o'clock at night and the manager and his assistant started in the machine to the post office to mail the invoice, but in making the trip to the post office they left the street leading directly to the post office and went to the express office to obtain a package belonging to the assistant and while out of the direct course to the post office the manager negligently ran the machine against a pedestrian to his injury. The deviation in driving the machine to the express office with the intention of continuing in the business of the employer in mailing the invoice was not sufficient to relieve the oil company from liability for the injury to the pedestrian.

Pierce-Fordyce Oil Association v. Brading, —— Tex. Civ. App. ——, 212 Southwestern 707, p. 709.

BONDHOLDERS' CONSENT TO LEASE—RIGHT TO SELL—ESTOPPEL.

A trust deed securing the bondholders of a mining corporation authorized the sale of the property in case of default and also provided that the owner could with the consent of the trustee lease the property for mining operations. The bondholders concluded that a sale of the property would be disastrous to them and consented that the mining corporation as owner should lease the property so that it could be successfully operated for the payment of interest. After so consenting to the lease and after the property was leased for mining operations the bondholders were estopped from foreclosing the trust deed and selling the property.

Oberman v. Red Rock Fuel Co., —— W. Va. ——, 99 Southeastern 66, p. 72.

MORTGAGE TAX—RIGHT TO RECOVER—MISTAKE AS TO TITLE.

The Federal Coal Company, a corporation of Kentucky, executed a mortgage on lands believed to be owned by it to secure a loan of $1,350,000. The statute of Kentucky imposes a tax of 20 cents upon each $100 of mortgage indebtedness. After the mortgage tax of $2,700 was paid by the coal company the deed conveying the mortgaged lands to the coal company was set aside and the mortgage of the coal company to secure the loan was canceled. The tax was not imposed upon the mortgage by the statute but upon the indebtedness secured by the mortgage. The mortgage evidenced the indebtedness and enabled the officer to know the amount of the tax to be collected upon the indebtedness. The tax was not recoverable by the coal company upon the theory that it was paid under a mistake of law or fact as the mistake consisted in its belief that it owned the title to the land when it did not. The coal company was not relieved of the indebtedness by its loss of the land, and there was no mistake about the execution of the mortgage. The taxing officer was under no duty to ascertain the coal company's title to the land nor was he under any duty to pass upon the sufficiency of the security afforded by the mortgage. His duty extended no further than to know that there was an indebtedness and that such indebtedness would not mature for five years and to collect the tax due on the amount of the indebtedness and record the mortgage. The coal company was not in the attitude of a person from whom a tax had been illegally collected, but as it was legally liable for the tax when paid the fact that by subsequent discovery its payment might have been avoided was not sufficient to authorize its recovery.

Greene v. Federal Coal Co., —— Ky. ——, 212 Southwestern 580.

OIL WELL DRILLER—LOSS OF TOOLS—LIABILITY—CUSTOM.

An oil company owning lands and leases employed a well driller to drill an oil and gas well upon its premises, for which the driller was to receive $1.75 a foot and $60 a day for day work and this included underreaming, pulling the pipes, cleaning out and other work of that kind. The driller employed his own men to do the work on the well. In the process of drilling the well a strong flow of gas was struck. The gas was permitted to flow from the well and was by the wind carried over and to the boiler used with an open fire for drilling and became ignited, thereby burning and destroying the tools of the driller. The oil company was not liable for the loss of the tools under the contract of employment and could not be held liable on proof of a general usage and local custom to the effect that where a driller is working for and under the direction of the owner of the well being drilled, the owner is responsible for losses to the drillers' tools resulting from fire. Proof of such a custom was inadmissible.

Henderson v. Magnolia Petroleum Co., —— Kan. ——, 180 Pacific 228.

INTERSTATE COMMERCE—LOCAL REGULATIONS.

A natural gas company engaged in transporting natural gas from one State to another and from its main pipe line supplied gas for domestic purposes also, is not engaged in interstate commerce so as to prevent it from being subject to the local workmen's compensation act and liable for injuries to an employee engaged in the State in assisting in the excavation of a ditch for the purpose of laying an additional pipe line to increase the capacity.

Roberts v. United Fuel Gas Co., —— W. Va. ——, 99 Southeastern 549, p. 551.

MINING PARTNERSHIPS.

JOINT ADVENTURE AND PARTNERSHIP—DISTINCTION.

The principal distinction between a partnership and a joint adventure is that generally in the latter case one party may sue the other at law for a breach of the contract; but this right to sue at law does not preclude a suit in equity for an accounting as between the joint adventurers the same as in a partnership. The remedy at law does not preclude a suit in equity for an accounting.

Miller v. Walsert, —— Nevada ——, 181 Pacific 437, p. 442.

JOINT ADVENTURERS—RIGHTS, DUTIES, AND LIABILITIES.

Four persons entered into a joint contract of adventure to purchase mining claims upon which one of them held an option. It was agreed that the one holding the option was to contribute to the joint adventure his option to purchase; another was to contribute his services and knowledge as an experienced mining engineer in examining the property, the third was to contribute his legal services, and the fourth was to contribute money to bear the expenses. The money was not to be paid until the engineer had made his investigation and reported the probable value of the property. It was discovered upon examination by the engineer that the mining property was of great value, and thereupon three of the parties, in the absence of the fourth, who was to advance certain money, themselves advanced the necessary money, purchased the claims, and secured title to the property. No opportunity was given the fourth member to pay or advance the money according to the contract. Under these facts an implied trust was created as effectually as if the promising member had actually furnished the consideration to purchase the property. The money advanced by the three parties to the contract would be in the nature of a loan to the joint adventurers and for the benefit of all the joint adventurers, but the advancement of the money under such circumstances did not entitle the parties so advancing to any separate rights as against their coadventurer.

Miller v. Walsert, —— Nevada ——, 181 Pacific 437, p. 441.

JOINT ADVENTURERS—FIDUCIARY RELATION—GOOD FAITH.

The relation between joint adventurers to purchase mining property is fiduciary in its character, and the utmost good faith is required of the trustee to whom the deal or property may be entrusted and such trustee will be held strictly to account to his coadventurers and will not be permitted by reason of the possession of the property or profits, whichever the case may be, to enjoy an unfair advantage or have any greater rights in the property by reason of the fact that he is in possession of the property or profits as trustee than his coadventurers are entitled to. The fact that he was entrusted with the rights of his coadventurers imposes upon him the sacred duty of guarding their rights equally with his own, and he is required to account strictly to his coadventurers, and they may recover after a denial by him of any of their rights.

Miller v. Walsert, —— Nevada ——, 181 Pacific 437, p. 441.

JOINT ADVENTURE TO ACQUIRE MINING PROPERTY—CONSIDERATION.

An agreement entered into by four persons to use their joint efforts to acquire certain mining property and convey title thereto to a corporation to be formed by them for the purpose of taking over the mining property is sufficient to establish a joint adventure; and a contract of joint adventure is sufficiently supported by a consideration growing out of the mutual promises of the parties.

Miller v. Walsert, —— Nevada ——, 181 Pacific 437, p. 441.

FAILURE TO COMPLY WITH STATUTE—VALIDITY OF LEASES—RIGHT OF OTHER PARTY TO ENFORCE.

A partnership was formed in Kentucky under a certain firm name for the purpose of engaging in the business of buying and selling oil and gas leases. The partnership failed to comply with the statute requiring the filing of a certificate by persons desiring to do business under an assumed name, and persons are prohibited from carrying on or conducting business under an assumed name without filing the required certificate in the office of the clerk of the county. A lease or contract made by a partnership without complying with the statute is unenforceable, but such a lease or contract is not void but is enforceable by the party not in fault, and he may compel specific performance or cancellation at his option on proper proof.

Warren Oil & Gas Co. v. Gardner, —— Ky. ——, 212 Southwestern, 456, p. 458.

EXTENT AND LIABILITY.

A mining partnership was formed for the purpose of drilling for oil and gas on certain described property. This partnership necessarily continued in the absence of an agreement to the contrary as respects the acquisition of additional property acquired and used in the line of business of the partnership and developed with partnership funds, labor, and material.

Rolshouse v. Wally, —— Pa. ——, 106 Atlantic 227.

ORAL AGREEMENT—PURCHASE AND SALE OF LEASE—STATUTE OF FRAUDS.

A partnership was formed for the purpose of obtaining oil and gas leases from landowners and then selling the leases. The contract of partnership was not in writing. On the purchase and sale of certain leases an excluded partner brought suit for an accounting and for a recovery from his associates for his share of the proceeds of the business. The fact that the leases themselves as between lessors and lessees were within the statute of frauds, because real estate was involved, did not affect the personal relation and obligation created by the agreement to deal in such instruments and divide the profits, and the statute of frauds would not prevent the plaintiff from recovering.

Bird v. Wilsox, —— Kan. ——, 180 Pacific 774, p. 775.

PURCHASE OF COAL LANDS—SPECIFIC PERFORMANCE—PREMATURE ACTION.

Two persons agreed to furnish equal sums of money to purchase Indian segregated coal lands to be sold by the Department of the Interior. The title was to be taken in the name of one for the joint use of both, and on demand a conveyance was to be made of a one-half interest therein to the other. The purchase price was furnished according to the agreement, and after the purchase the second partner demanded a conveyance of a one-half interest, and upon refusal instituted a suit for specific performance. But at the time of the commencement of the action the title to the land had not passed to the trustee by virtue of the certificate of purchase issued to him, and he was not entitled to the patent to the land until the conditions and terms of the sale were fully complied with. The action for specific performance was therefore prematurely brought and the plaintiff partner was not entitled to recover.

Mayhar v. Ward, —— Okla. ——, 180 Pacific 859 p. 860.

PRINCIPAL AND AGENT.

AUTHORITY OF AGENT—ESTOPPEL.

A mining company clothed certain of its officers, as agents, with apparent authority to procure an option upon mining claims, and such authority governs the mutual rights and liabilities growing out of the transactions between the company as principal and a third person with whom the agent dealt, and the company is estopped to deny the authority of its agent.

Hammitt v. Virginia Mining Co., —— Idaho ——, 181 Pacific 336, p. 337.

AUTHORITY OF MANAGER—LIABILITY OF PRINCIPAL.

A company of mining stock brokers engaged in the business of buying and selling mining stocks and mining securities had their general office at Salt Lake City. The company established a branch office at Eureka with a duly appointed manager in charge of the business of the company at such branch office. The manager of the branch office in the course of business received an order for the purchase of a thousand shares of the capital stock of a certain mining company, and thereupon placed the order with the principal company, and the stock was purchased, the purchaser paying the price and the commission to the manager of the branch office. The purchaser requested that the stock be retained in the possession of the principal so that notice of assessments or of dividends could be given through the company. The manager retained the stock, subsequently sold it and appropriated the proceeds. The purchaser of the stock under the circumstances had the right to assume that the manager was authorized to hold and retain the certificates of stock under his general authority as manager and the principal, the brokerage company, was liable for the conversion by the manager.

Sullivan v. Evans-Morris-Whitney Co., —— Utah ——, 180 Pacific 435, p. 438.

AUTHORITY OF SUPERINTENDENT OF COAL MINE—LIMITATION.

The superintendent of a coal mine in charge of the work impliedly has authority to employ and discharge miners and to make contracts necessary, properly to carry on the business of mining coal intrusted to him; but without specific authority he has no implied authority to make a contract to extend beyond a reasonable time and necessary to the successful operation of the mine.

Rua v. Bowyer Smokeless Coal Co., —— W. Va. ——, 99 Southeastern 213, p. 217.

OIL AND GAS LEASE—BANK AS AGENT OF LESSOR.

An oil and gas lease provided that it should become void if the lessee did not begin operations on or before a certain stated date, unless the lessee paid to the lessor, or deposited to his credit in a certain named bank, a stated amount before the date fixed. Under such a provision the bank became the sole agent of the lessor for the reception of the money and a payment or a tender to the bank of the amount within the time was sufficient to keep the lease alive.

Texas Co. v. Wimberly, —— Tex. Civ. App. ——, 213 Southwestern 286, p. 289.

TRUST DEED—TRUSTEE AS AGENT OF BANK—ESTOPPEL.

A trustee in a trust deed for mining property given to secure bonds of the company was a director of the coal company and also cashier of the bank holding a majority of the bonds. The president of the bank was also the president of the coal company. The president and the cashier of the bank in acquiescing in a lease of the coal property rather than requiring a sale under the trust deed, must be treated as the bank's agents duly authorized to act on its behalf and they and the bank were estopped from denying the agency.

Oberman v. Red Rock Fuel Co., —— W. Va. ——, 99 Southeastern 66, p. 72.

BENEFITS FROM UNAUTHORIZED ACTS—MINING CORPORATION—LIABILITY.

A mining company through its president and secretary paid money under the terms of a second option obtained by the officers of the company on a mining claim, and sought to have the payment credited to the company under a former option. The corporation seeking to retain a benefit derived from the unauthorized act of its agent or officer is chargeable with the instrumentality thus employed and will not be permitted to disclaim responsibility flowing therefrom and to claim or retain the fruits of the transaction.

Hammitt v. Virginia Min. Co., —— Idaho ——, 181 Pacific 336, p. 338.

MINING TERMS.

ACCIDENT.

An "accident" is an undesigned, sudden, and unexpected event, usually of an afflictive or unfortunate character and often accompanied by a manifestation of force.

Gilliland v. Ash Grove Lime & Portland Cement Co., —— Kan. ——, 180 Pacific 793, p. 794.

ANNUAL ASSESSMENT WORK.

Annual assessment work as applied to a mining claim has nothing to do with locating or holding a claim before discovery. It is a condition subsequent to discovery and location to be performed in order to preserve to the locator the exclusive and continued right of possession.

Union Oil Co. v. Smith, 39 Supreme Ct. Rep. 308, p. 311.

DAY MAN.

A day man in a mine is one whose duty it is to go through the entries and see that they are safe.

Teter v. Central Coal & Coke Co., —— Mo. App. ——, 213 Southwestern 135, p. 136.

COURSE OF EMPLOYMENT.

The term "course of employment" means where a miner is working within the period of the employment at a place where he may reasonably be and while he is reasonably fulfilling the duties of his employment or is doing something incidental thereto.

Granite Sand & Gravel Co. v. Willoughby, —— Ind. App. ——, 123 Northeastern 194, p. 195.

FIRST AID.

First aid as applied to an injured miner is defined to be immediate attention given to an injured miner with the object of arresting hemorrhage, relieving pain, and preserving life until the services of a physician can be obtained.

Hunicke v. Meramec Quarry Co., —— Mo. ——, 212 Southwestern 345, p. 346.

GENERAL MANAGER.

The term "general manager" imports general authority to perform all reasonable things in conducting the usual and customary business of his principal.

Hinton v. D'Yarmett, —— Tex. Civ. App. ——, 212 Southwestern 518.

GOOD CLEAN HOLE.

As applied to oil well drilling a "good clean hole" is one free from those things the presence of which would render the well incapable of use as a well.

Bain v. White, 256 Federal 428, p. 432.

HEADER.

A header consists of a piece timber from four to six inches square and from ten to twelve feet in length and is placed across the weak portion of a roof and is supported by posts under each end, thus leaving a space for operating a coal cutting machine.

Consolidated Coal Co. v. Marcum, 257 Federal 287, p. 289.

IMPROVEMENTS.

The term "improvements" used in a contract of sale of a mine means such things as are placed thereon by way of betterment and which are of a permanent nature and which add to the value of the property as real property and aid in the extraction of ores profitably and successfully.

Seigloch v. Bisbee, —— Wash. ——, 181 Pacific 51 ,p. 53.

INJURY.

The term "injury," as used in the constitution of Montana, means such an injury as the law recognizes or declares to be actionable.

Shea v. North Butte Min. Co., ——— Mont. ———, 179 Pacific 499, p. 502.

KILL.

The word "kill" as applied to an oil or gas well means to shut off the flow of oil or gas temporarily or to destroy the well entirely so that neither oil nor gas can flow.

Department of Conservation v. Louisiana Gas & Fuel Co., 144 La. —, 81 Southern 454.

ORIGINAL PACKAGE.

The term "original package" is properly applied to natural gas transported by pipe lines.

West Virginia & Maryland Gas Co. v. Towers, ——— Md. ———, 106 Atlantic 265, p. 268.

MINING CLAIMS.

MINERAL CHARACTER OF LAND.

DEPOSIT OF LIMESTONE.

Limestone deposits that may be used as a Portland cement ingredient are not of such an exceptional nature as to warrant the adjudication as mineral of land upon which they may be shown to exist. The fact that a deposit of limestone may be used in the construction of surfacing of roads does not render the land upon which it occurs mineral land within the meaning of the mining laws.

Gray Trust Co., In re, 47 Land Decisions 18, p. 20.

ANY DISCOVERY WITHIN CLAIM SUFFICIENT.

The original discovery point in a mining location was lost by a suit on an adverse claim, but a discovery upon the remaining part of the claimed ground that was more than 300 feet distant from the side line of the claim was sufficient to evidence the mineral character of the land and to entitle the applicant to a patent for the remaining portion of his location.

Star Gold Min. Co., In re, 47 Land Decisions 38, p. 43.

LOCATION OF CLAIM.

LOSS OF DISCOVERY POINT.

A valid subsisting mining location has the effect of a grant and operates as a bar to a second location, and if title to a discovery fails so must the location which rests upon it, the loss of discovery being the loss of the location.

Star Gold. Min. Co., In re, 47 Land Decisions 38, p. 40.
See Swanson v. Sears, 224 U. S. 180.

LOCATION NOTICE.

REQUIREMENT—SUFFICIENCY.

The statutes of some of the States require that location notices shall be conspicuously posted on the claim, but the statute of Arizona (Civil Code 1913, par. 4028) requires a conspicuous monument of stone or an upright post securely fixed projecting at least 4 feet above the ground, in which monument of stone or on which post there shall be posted a location notice. Under this statute a location notice stuck in the crevice between the rocks of the monument of stone, although hidden from view by dirt and gravel, was a substantial compliance with the statute in posting notice where there was no indication that there was any intentional concealment, although it is manifest that some precaution must be taken by a prospector to protect his location notice from destruction.

Hagan v. Dutton, —— Ariz. ——, 181 Pacific 578, p. 581.

SUFFICIENCY OF DESCRIPTION.

The object and purpose of a location notice is to give notice to subsequent locators, but if a subsequent locator has actual notice of a prior location he will be bound thereby although the notice may be defective. A description in the location notice was not sufficiently definite to give constructive notice of the location of a claim, but where the proposed locator was informed of an existing location and was shown the actual markings and monuments on the ground, these were sufficient to inform him of the rights of the prior locator.

Thompson v. Underwood, —— Ark. ——, 211 Southwestern 164, p. 165.

LIBERAL CONSTRUCTION—DESCRIPTION OF CLAIM.

Notices of the location of mining claims should be liberally construed having reference to the circumstances under which and the character of the parties by whom they are generally made. In determining the sufficiency of a location notice the most important guide is the purpose of the notice which is to identify the land claimed with reasonable certainty. The mining statute expressly provides that the description of a mining claim may be made "by reference to some natural object or permanent monument as will identify the claim located." A description of a claim in a notice that makes a well-defined ledge the center of the claim and also makes a stone monument referred to as the point of discovery the starting point for the measurements given and which defines the other dimensions of the claim by reference to the well-defined ledge on the claim with a statement of the number of feet in width on each side of the lode or vein is a sufficient description.

Sidney v. Richards, —— Cal. App. ——, 181 Pacific 394.

CONSTRUCTION—NATURAL OBJECTS.

Mineral deposits are frequently discovered in the wilderness remote from a Government survey and the discoveries are usually made by men who are not equipped with proper instruments or possessed of sufficient education to enable them to correctly run lines, make measurements, and accurately describe the land sought to be located. Considering these facts a location notice is sufficient if it will impart notice to subsequent locators.

Independence Placer Min. Co. v. Knauss, —— Idaho ——, 181 Pacific 701, p. 703.

DISCOVERY.

ESSENTIAL TO VALIDITY.

In order to create valid rights or initiate title as against the United States to a mining location, a discovery of mineral is essential.

Union Oil Co. v. Smith, 39 Supreme Ct. Rep. 308, p. 310.
See United States Mining Statutes Annotated, 64.

TIME OF MAKING.

Discovery is the indispensable fact in a mining location and the marking and recording of the claim dependent upon it; but the order of time in which these acts occur is not essential to the acquisition from the United States of the exclusive right of possession of the discovered mineral or the obtaining of a patent therefor; but discovery may follow after location and give validity to the claim as of the time of discovery, provided the rights of third persons have not intervened.

Union Oil Co. v. Smith, 39 Supreme Ct. Rep. 308, p. 310.
See United States Mining Statutes Annotated 71.

CONDITION OF VALID LOCATION.

The discovery of mineral within the limits of a mining claim located is a necessary prerequisite to a complete and valid mining location.

Hagan v. Dutton, —— Ariz. ——, 181 Pacific 578, p. 580.
See United States Mining Statutes Annotated, 23, 64.

DISCOVERY BY FORMER LOCATOR—PRESUMPTION.

Discovery of valuable deposits of minerals is essential to a valid mining location but a locator need not be the first or original discoverer of mineral on the claim. He may appropriate an abandoned or forfeited discovery by locating the claim as a relocation, and it is sufficient if he knew at the time of making his location that there had been a discovery of mineral on the location.

Hagan v. Dutton, — Ariz. —, 181 Pacific 578, p. 580.

DISCOVERY POINT MUST BE WITHIN LOCATION.

A mineral applicant must show that the discoveries were on the vein or that another discovery had been made upon the vein prior to application for patent and the discovery must be within the limits of the claim. A discovery without the limits of a claim, no matter what its proximity, does not suffice.

Star Gold Min. Co., In re, 47 Land Decisions 38, p. 40.
See Waskey v. Hammer, 223 U. S. 85, p. 91.
United States Mining Statutes Annotated, 68, 181.

DISCOVERY IN SHAFT.

The statute of Arizona (Civil Code, Par. 4030) requires a discovery shaft to be sunk within 90 days after the location.

Hagan v. Dutton, —— Ariz. ——, 181 Pacific 578, p. 581.

QUESTION OF FACT.

Whether or not there has been a discovery of mineral on a mining claim, within the meaning of the United States statute was a question of fact for the trial court to determine under the evidence in a controversy between rival claimants.

Hagan v. Dutton, —— Ariz. ——, 181 Pacific 578, p. 580.

GROUP CLAIM—DISCOVERY ON EACH CLAIM.

The act of 1903 (32 Stats. 825, Comp. Stats. Sec. 4636), does not by virtue of the proviso excuse or dispense with actual discovery of oil on each of a group of claims although the discovery work, the act of drilling a well upon one claim may have a tendency to determine the oil-bearing character of the contiguous claims. Such work does not confer upon the locator inchoate rights in the other claims of the group of which the latter was not in actual possession and upon none of which a discovery of oil had been made.

Union Oil Co. v. Smith, 39 Supreme Ct. Rep. 308, p. 312.

RIVAL MINERAL CLAIMANTS—PROOF.

In actions between rival mineral claimants the rule as to proof of the discovery of minerals is more liberal than in other actions.

Hagan v. Dutton, — Ariz. —, 181 Pacific 578, p. 580.

VEIN OR LODE.

PRESUMPTION OF EXISTENCE.

The statute (sec. 2320, Rev. Stats.) contemplates that the claimant will locate not exceeding 1,500 feet along the discovered vein or lode, and there arises a presumption, essentially one of fact, that the located vein extends throughout the length of the claim.

Star Gold Min. Co., In re, 47 Land Decisions 38, p. 42.

OWNERSHIP OF ALL VEINS.

The locator of a mining claim is not only entitled to the discovered vein but to all other veins, lodes, and ledges apexing within the ground included in the surface location.

Star Gold Min. Co., In re, 47 Land Decisions 38, p. 42.

MARKING LOCATION.

NATURAL OBJECTS—PERMANENT MONUMENTS.

A location notice giving the name of the claim and showing that it was tied to the junction of two named creeks, and a description showing that another claim was tied to a cabin on the first-named claim and that another named claim was tied to a flume on the first-named claim with reference to the northerly side of a named creek, must be regarded as sufficient, as the junction of the two creeks is a natural object, and the cabin and the flume are permanent monuments within the means of the mining statutes.

Independence Placer Min. Co. v. Knauss, — Idaho —, 181 Pacific 701, p. 703.
See United States Mining Statutes Annotated, 227.

ASSESSMENT WORK.

FAILURE TO PERFORM—ESTOPPEL.

The owner of an interest in a mining claim who stood by from 1904 until 1915 and who neither performed nor paid his part of the assessment work, and contributed nothing toward the success of the mine and apparently abandoned whatever interest he had, can not. neither can his assignee, assert and reclaim an interest in the mining claim as against a relocator.

Harvey v. Laurier Min. Co., — Wash. —, 179 Pacific 864.

FORFEITURE BY COOWNER—ADVERSE POSSESSION.

A part owner of a mining claim can not forfeit his coowner's interest because of the coowner's failure to perform or to contribute to the performance of the assessment work, where during the period of time when the annual assessment work was to be done the coowner was by the part owner insisting on forfeiture, denied permission to enter upon the claim or to contribute to the assessment work.

Becker-Franz Co. v. Shannon Copper Co., 256 Federal 522, p. 523.

GROUP CLAIMS—DISCOVERY WORK—ACT OF 1903.

The act of 1903 (32 Stats. 825, Comp. Stats. sec. 4636), provides that upon oil claims located as placer mining claims, the annual assessment work may be done upon one of a group of contiguous claims under a common ownership, provided the labor will tend to the development "or to determine the oil-bearing character of such contiguous claims." In construing this statute the United States Supreme Court said: "It is hardly necessary to say that the discovery of oil upon several contiguous claims does not render it wholly unimportant that assessment work thereafter done by the common owner upon one of the claims, in order to be credited to him as if it had been distributed among the several claims shall be of general benefit to the group. This is the object of the act, and except as the proviso specifically declares 'determination of oil-bearing character' to be of benefit to the contiguous claims, little is added to the effect of section 2324, Rev. Stats., respecting group assessment work. But we can not declare a determination of the 'oil-bearing character' of a claim upon which oil already has been discovered to be a matter so idle as to require us to seek a strained construction of the statute. In our opinion the act shows no purpose to dispense with discovery as an essential of a valid oil location or to break down in any way the recognized distinction between the pedis possessio of a prospector doing work for the purpose of discovering oil and the more substantial right of possession of one who has made a discovery and performs annual development work to maintain his right to the mineral until patent is obtained."

Union Oil Co. v. Smith, 39 Supreme Ct. Rep. 308, p. 312.

AFFIDAVITS OF PERFORMANCE—PERJURY.

The making of false affidavits as to the performance of assessment work on a placer claim may constitute perjury, and an indictment was sufficient without stating the particular statute under which it was made. Where the evidence for the prosecution was not sufficient alone to justify a conviction, but taken in connection with the contradictions and discrepancies in the testimony of the defendant a verdict of guilty was not disturbed on appeal.

Vedin v. United States, 257 Federal 550, p. 551.

FORFEITURE.

PROOF ON RELOCATION—BURDEN.

Where a mining location was made upon ground alleged to be forfeited for failure to perform the annual assessment work or to make the required improvements, the burden of proving such forfeiture was upon the relocator.

Copper State Min. Co. v. Kidder, —— Ariz. ——, 179 Pacific 641, p. 646.

ABANDONMENT.

PROOF ON RELOCATION.

A relocator attempting a relocation upon ground previously located has the burden of proving that the original location had been abandoned.

Copper State Min. Co. v. Kidder, —— Ariz. ——, 179 Pacific 641, p. 646.

RELOCATION.

EXISTING VALID LOCATION—GROUND WITHDRAWN.

An attempted relocation of a mining claim upon a valid existing location is wholly void for the purpose of founding any right or claim to the ground. Ground withdrawn from the public domain by prior valid and subsisting location is not subject to relocation.

Hagan v. Dutton, —— Ariz. ——, 181 Pacific 578, p. 582.

ADOPTION OF MONUMENTS.

A person intending to relocate certain mining ground erected discovery monuments on an existing mining claim with the consent or without objection of the then owner. Such monuments could be legally adopted on a subsequent relocation of the claim, although the monuments were built at a time when the ground was not open to location. The rule is that discovery monuments existing on the ground at the time of the location may be adopted by a relocator, either by rebuilding partially existing monuments or availing himself of existing monuments by using them, and this is a compliance with the law, and the use of such monuments for the purpose of marking the boundaries of a claim is a sufficient compliance with the statute and creates a valid relocation on the performance of other requirements.

Hagan v. Dutton, —— Ariz. ——, 181 Pacific 578, p. 582.

ABANDONMENT OR FORFEITURE—BURDEN OF PROOF.

Where a mining location is made upon ground as abandoned, or forfeited, for failure to do the annual work or make the required improvement, the burden of showing such abandonment or forfeiture is upon the relocator.

Copper State Min. Co. v. Kidder, —— Ariz. ——, 179 Pacific 641, p. 646.
See Cunningham v. Pirrung, 9 Ariz. 288, 80 Pacific 329.
Hammer v. Garfield Min. Co., 130 U. S. 290. 19 Sup. Ct. 548.

AGREEMENT TO PROTECT—DUTY TO PAY.

Where it was claimed that the relocator of a mining claim agreed to protect the interest of a part owner of the original claim upon the payment by such part owner of the expense incurred by the relocator in the performance of the assessment work and in operating the mine, it was the duty of such part owner to offer to pay his share of such expenses before demanding and seeking to recover his interest in the relocated claim.

Harvey v. Laurier Min. Co., —— Wash. ——, 179 Pacific 864, p. 865.

DESCRIPTION.

SUFFICIENCY OF DESCRIPTION.

The description of a mining claim is sufficient if by any reasonable construction, in view of the surrounding circumstances, the language employed in the description will impart notice to a subsequent locator.

Independence Placer Min. Co. v. Knauss, —— Idaho ——, 181 Pacific 701, p. 703.
See United States Mining Statutes Annotated, 226.

POSSESSORY RIGHTS.

RIGHTS BEFORE DISCOVERY—PEDIS POSSESSIO PROTECTED.

Section 2319, United States Revised Statutes, extends an express invitation to all qualified persons to explore the public lands for valuable mineral deposits; and persons who proceed in good faith to make such explorations and enter upon vacant public lands for that purpose are not treated as trespassers, but as licensees or tenants at will. The exploration must precede the discovery of minerals, and some occupation of the land is necessary for adequate and systematic exploration, and it must follow that legal recognition of the pedis possessio of a bona fide and qualified prospector is regarded as a necessity. Such a prospector may hold the place in which he may be working against all others, having no better right, and while he remains in possession diligently working toward discovery, he is entitled for at least a reasonable time to be protected against forcible, fraudulent, and clandestine intrusions upon his possession.

Union Oil Co. v. Smith, 39 Supreme Ct. Rep. 308, p. 310.
See United States Mining Statutes Annotated, 117.

POSSESSION BEFORE DISCOVERY—EXTENT OF PROTECTION.

The United States Supreme Court conceded that the Supreme Court of California extended the rule of protection to the locator of a mining claim before discovery "not only as far as the pedis possessio but to the limits of the claim as located," and that under the rule established by that court the locator has the right to maintain possession as against violent, fraudulent, and surreptitious intrusion so long as he continues to occupy the land to the exclusion of others and diligently and in good faith prosecutes the work of endeavoring to discover valuable mineral thereon. But in the case recognizing this rule of the California court, the Supreme Court expressly said that the extent of the possessory right of a locator before discovery was a question not raised in the case.

Union Oil Co. v. Smith, 39 Supreme Ct. Rep. 308, p. 310.
See United States Mining Statutes Annotated, 117.

PROPERTY RIGHTS—TRANSFER.

Without a patent, the possessory right of a qualified locator of a mining claim after discovery of minerals upon the claim is a property right in the full sense, unaffected by the fact that the paramount title to the land is in the United States, and such right is capable of being transferred by conveyance, inheritance, or devise.

Union Oil Co. v. Smith, 39 Supreme Ct. Rep. 308, p. 311.
See United States Mining Statutes Annotated, 122.

EXTENT AND EFFECT.

A discovery of mineral by a qualified locator upon unappropriated public lands initiates substantial rights as against the United States and all the world. If the locator makes a record of his claim in accordance with section 2334 (U. S. Rev. Stats.), and the pertinent local laws and regulations, he has, by the terms of section 2322, an exclusive right of possession to the extent of his claim as located, with the right to extract the minerals, even to exhaust them without paying any royalty to the United States as owner and without ever applying for a patent or seeking to obtain title to the fee. The continued possessory right is subject to the performance of the annual labor as provided in section 2324, for upon the failure to do this the claim is open to relocation by others at any time before resumption of work by the original locator.

Union Oil Co. v. Smith, 39 Supreme Ct. Rep. 308, p. 311.
See United States Mining Statutes Annotated, 116.

ACTUAL OCCUPATION UNNECESSARY—ABANDONMENT AND FORFEITURE.

Actual and continuous occupation of a valid mining location based upon discovery is not essential to the preservation of the possessory right. The court's opinion reads: "The right is lost only by abandonment, as by the nonperformance of the annual labor required by section 2324."

Union Oil Co. v. Smith, 39 Supreme Ct. Rep. 308, p. 311.

NOTE: The court in this case fails to recognize the distinction between abandonment and forfeiture of a mining claim. The possessory right of the locator, the court said, "is lost only by abandonment as by the nonperformance of the annual labor." The right of possession of an unpatented mining claim may be lost by "abandonment" at any time. Abandonment has no relation whatever to the performance of the annual assessment labor. "Abandonment" may be complete at any time, but a "forfeiture" can only take place after the expiration of the statutory period for performing the annual assessment work and on failure to do the required work. The same court in the familiar case of Lavignino v. Uhlig, 198 U. S. 443, failed to make this distinction between abandonment and forfeiture, and the decision created some confusion among courts of the metal mining States. The error was corrected in the case of Farrell v. Lockhart, 210 U. S. 142, and the distinction pointed out though the former case was not expressly overruled.—Author.

See United States Mining Statutes Annotated, 254, 258, 495.

POSSESSION PROTECTED—ERROR IN LOCATION.

A person who locates a mining claim in good faith is protected in his possession of the surface marked out, although subsequent developments may show that the location of the apex of the vein was erroneous.

Star Gold Min. Co., In re, 47 Land Decisions 38, p. 42.
See Harper v. Hill, 159 Cal. 250, 113 Pac. 162.

MINERAL LANDS IN TOWNSITES.

Section 2386 (U. S. Rev. Stats.) provides that where mineral veins are in the possession of a locator whose possession is recognized by local authority the title to town sites shall be subject to such recognized possession and the necessary use thereof.

Golden Center of Grass Valley Min. Co., In re, 47 Land Decisions 25, p. 27.
See United States Mining Statutes Annotated, 1354.

RAILROAD RIGHT OF WAY—RELATIVE RIGHTS.

A railroad right of way over and across a mining claim as a part of a national forest was superior to the right of the mining claimant who held under his mining claim until the land was opened and who then made application and obtained patent under the homestead law.

Van Dyke v. Arizona Eastern R. Co., 248 U. S. 49, p. 52.

CONTRACT OF SALE—FORFEITURE—RIGHT TO IMPROVEMENTS.

The owner of mining claims entered into a contract of sale by which the purchaser was to pay $30,000.00 in instalments. The contract expressly provided that time was the essence of the contract and on failure of the purchaser to make the payments agreed upon the contract should become void and the purchaser forfeit all rights thereunder and all payments made should be forfeited as liquidated damages and the seller should take immediate possession of the property with all improvements placed thereon by the purchaser. The improvements placed upon the property claimed under the forfeiture clause in part consisted of iron water tanks, rails for the railroad tracks laid in place and a large lot of iron pipes, which were more or less attached to the freehold; and also a quantity of sundry loose mining tools, equipment and supplies useful in the operation of the mine, but in no sense improvements on the realty. The term "improvements" used in the contract has a broader significance than that accorded to the term "fixtures." Improvements within the meaning of the forfeiture clause included those things of a permanent nature which tended to increase the value of the property as a mine and to aid in the extraction of ore profitably. The articles specifically mentioned are improvements of a permanent nature which enhance the value of the realty for the uses for which it was intended. But the term does not include the loose mining tols, equipment and supplies though useful in mining operations but in no sense improvements on the realty.

Siegloch v. Bisbee, —— Wash. ——, 181 Pacific 51, p. 52.
See Virginia Min. Co. v. Haeder, —— Idaho ——, 181 Pacific 141.

ADVERSE POSSESSION—PARTITION—RECOVERY FOR ASSESSMENT WORK.

In a suit for partition of a mining claim a court of equity may direct payment by one cotenant to another of his proportionate share of assessment work made necessary to maintain the life of the claim. But this right to contribution is lost in the case where the cotenant in possession holds adversely to his cotenant and refused to permit him to enter upon the claim or to contribute his proportion of the expenses of the assessment work, as the claim for contribution is inconsistent with the prior acts of the cotenant in possession and estops him to claim compensation.

Becker-Franz Co. v. Shannon Copper Co., 256 Federal 522, p. 524.

LEASE—RECOVERY OF RENT—DEFENSE.

The locator of a mining claim leased a part of the surface for business purposes and gave the lessee the privilege of erecting certain buildings and structures thereon. In an action to recover instalments of rent due, the lessee can not defeat a recovery on the ground that the mining location was void for the reason that no mineral was discovered within the claim, or that the locator failed to record his notice of location within the statutory period or that the locator failed to perform the assessment work during certain years, as this would permit the tenant to deny the landlord's title. If the lessor's title failed for any reason the lessee would have his remedy on the implied warranty of title.

Lynch v. Clark, —— Ariz. ——, 179 Pacific 960, p. 962.

POSSESSORY ACTIONS.

SUIT TO QUIET TITLE—PLEADING.

A complaint to quiet title to an unpatented mining claim is sufficient where there is an allegation in ordinary and concise terms to the effect that the plaintiff is the owner and in possession of the described property, without setting out matters of evidence or probative facts; and an allegation that the defendant claims an adverse interest or estate is sufficient without defining it.

Hammitt v. Virginia Min. Co., —— Idaho ——, 181 Pacific 336, p. 337.

QUIETING TITLE—DESCRIPTION OF CLAIM.

The relocator of a mining claim can not maintain an action to quiet his title as against the original locator where the original location notice contained a sufficient description of the ground sought to be located and where there was an honest attempt by the original locator to locate the claim and there was a sufficient compliance with the requirements of the law and especially where the relocator had actual knowledge of the extent of the original claim.

Sidney v. Richards, —— Cal. App. ——, 181 Pacific 394, p. 395.

OWNERSHIP—PLEADING.

In a suit to quiet title to a mining claim the complaint need not allege in detail the manner in which the claim was located nor the qualifications of the locator. In such a case it is only necessary to allege the ultimate fact of the complainant's interest in, or claim to, the property. Although a complaint to quiet title to a mining claim did not sufficiently describe or identify the claim, but where the complainant at the trial introduced the notices of location, together with oral testimony touching the location and description, and this evidence was admitted without objection as to the sufficiency of the complaint, it is sufficient to sustain the judgment.

Independence Placer Min. Co. v. Knauss, —— Idaho ——, 181 Pacific 701, p. 702.

MINERAL CLAIMANTS—DISCOVERY RULE.

In a possessory action between two mineral claimants the rule respecting the sufficiency of discovery of valuable mineral deposits is more liberal than when it is between a mineral claimant and one seeking an agricultural entry. The reason of this is that where land is sought to be taken out of the category of agricultural land the evidence of its mineral character should be reasonably clear, while in respect to mineral lands in the controversy between claimants the question is simply which is entitled to priority.

Hagan v. Dutton, —— Ariz. ——, 181 Pacific 578, p. 580.

PROOF OF DISCOVERY IN DISCOVERY SHAFT.

In an action between rival claimants for the possession of a mining claim the issue as to whether the evidence had disclosed mineral in place had reference to a discovery of mineral in the discovery shaft which the statute of Arizona (Civil Code, Paragraph 4030, Subdiv. 2), requires to be sunk within 90 days after the location.

Hagan v. Dutton, —— Ariz. ——, 181 Pacific 578, p. 581.

PROOF OF LOCATION ON UNOCCUPIED LAND.

In an action for the possession of a mining claim it is sufficient where the complainant testified without objection that his claim was located on unappropriated government lands. Such proof is sufficient to sustain a finding of the jury in favor of the complainant.

Thompson v. Underwood, —— Ark. ——, 211 Southwestern 164, p. 165.

FAILURE TO ASSERT—LACHES.

The fact that mining property is more subject to sudden and violent fluctuations of value than other property requires persons having claims to mining property to use the utmost diligence in enforcing them and any unreasonable failure to do so would be fatal. There is no class of cases in which the doctrine of laches has been more relentlessly enforced than in possessory actions for mining claims.

Harvey v. Laurier Min. Co., —— Wash. ——, 179 Pacific 864, p. 165.

LESSOR MAY SUE TRESPASSER FOR POSSESSION.

The locator of a valid mining claim upon unappropriated government lands may maintain ejectment for the possession of the claim against a trespasser or against a person in unlawful possession although he had leased or granted to another the right to enter upon and mine the claim on a royalty basis. The execution of the lease in no way affected his right to maintain ejectment for the possession of the land against a trespasser or one holding it unlawfully.

Thompson v. Underwood, —— Ark. ——, 211 Southwestern 164, p. 165.

COAL LOCATIONS.

SALE BEFORE ENTRY—SUBSEQUENT TITLE INURES TO PURCHASER.

A qualified locator filed his coal declaratory statement giving him a right to make entry of certain coal lands. Before completing the entry he conveyed the land by deed to a purchaser and under an agreement completed his entry and after a space of more than three years obtained a patent and delivered the same to the purchaser. The legal title to the land did not pass at the time of the original conveyance by the entryman, but when he received his patent and delivered it to his grantee and received the remainder of the purchase price certainly no title still remained in him which he could assert against his grantee and there was no title which he could convey to a third person and particularly to a third person who was not an innocent purchaser for value. Having no title at the time he conveyed for a full and valuable consideration, when he subsequently acquired title by patent, such title inured to his grantee.

Ketchum v. Pleasant Valley Coal Co., 257 Federal 274, p. 276.

ADVERSE POSSESSION.

A coal land entryman after filing a declaratory statement conveyed the land to a purchaser and under an agreement completed his entry, obtained a patent and delivered the same to the purchaser. The purchaser took possession of the property under the conveyance before the issuance of the patent and held possession for about thirty years, paid the taxes, erected a store house, trestle, coal tipple, dwellings for employees, offices, power house, tram line, coke ovens, railroad tracks and other improvements at an expenditure of about a quarter of a million dollars. The possession was held and the improvement made with the knowledge of the original grantor and of the adverse claimant. A court of equity will grant no relief under such circumstances.

Ketchum v. Pleasant Valley Coal Co., 257 Federal 274, p. 277.

APPLICATION FOR PATENT—PAYMENT OF PURCHASE PRICE.

An applicant for a patent for a coal location may at his option pay for the land at the time of the filing or at any time thereafter up to fifteen days from and after receipt of notice from the Register.

But if payment is not made at the time of filing the application and an increase in value subsequently occurs the applicant will be required to pay the new or higher price.

Thomas, In re, 47 Land Decisions 43, p. 44.
See United States Mining Statutes Annotated, 748.

PATENT TO COAL LANDS—COLLATERAL ATTACK.

An applicant for coal land filed a coal declaratory statement giving him a right to make entry of the land, but before he made entry he conveyed the land by deed to a purchaser. Subsequently the applicant made application to make entry and to purchase the land from the Government and a patent was thereafter issued to him and thereupon he delivered the patent to the purchaser. This arrangement was pursuant to an agreement at the time the applicant executed the deed to the land. The patent issued to the original applicant was not void, but at most voidable and the Government alone could complain of the alleged invalidity.

Ketchum v. Pleasant Valley Coal Co., 257 Federal 274, p. 275.

OIL LOCATIONS.

RIGHTS PRIOR TO DISCOVERY.

A locator of mineral lands has no legal status or right to the property against the Government prior to discovery, except such as is given him by the act of June 25, 1910, known as the Pickett Act (36 Stat. 847, Comp. Stats. Secs. 4523–4525). Prior to discovery his right is a mere possessory one, protected and recognized against forcible or clandestine entry by a third person while he is in good faith making a discovery, although open to entry of others by legal means for the purpose of location.

United States v. Rock Oil Co., 257 Federal 331, p. 33.

ASSESSMENT WORK—PERFORMANCE ON GROUP CLAIMS.

The act of Congress approved February 12, 1903 (32 Stats. 825, Comp. Stats. Sec. 4636), provides that where oil lands are located as placer mining claims the annual assessment labor may be done upon any one of a group of claims lying contiguous and owned by the same person or corporation not exceeding five claims. The terms "assessments" and "annual assessment labor" used in this statute refer to the annual labor required by section 2324, Revised Statutes, being commonly called and known by miners as the "annual assessment" or the "assessment work" as described in many judicial opinions and in at least two acts of Congress. The annual "assessment work" has nothing to do with locating or holding a claim before discovery but is a condition subsequent prescribed by Congress to be performed in order to preserve exclusive right to the possession of a valid mineral land location. The provision in the act of 1903 permitting annual assessment labor upon any one of a group of oil claims lying contiguous and owned by the same person indicates the legislative purpose that the necessary assessment work if done upon one of the group should have the same effect as if distributed among the several claims; and this effect is that of preserving the exclusive right of possession and enjoyment conferred by section 2322 (Rev. Stats.).

Union Oil Co. v. Smith, 39 Supreme Ct. Rep. 308, p. 311.
See United States Mining Statutes Annotated, 245.

GROUP CLAIMS—ASSESSMENT WORK.

The privilege of performing the assessment work upon one of a group of oil claims lying contiguous and owned by the same person or corporation as provided for in the act of February 12, 1903 (32 Stats. 825), did not originate with that act. The economy of operating contiguous mining claims by a single system has been recognized from an early period. Section 2324 (Rev. Stats.), expressly provides that where claims are held in common the expenditure may be made upon any one claim, but it is the rule that the work must be done for the common benefit or for the purpose of developing all the claims; and the act of 1903 contains the proviso that the labor will benefit or tend to the development of the contiguous claims.

Union Oil Co. v. Smith, 39 Supreme Ct. Rep. 308, p. 311.
See United States Mining Statutes Annotated, 245.

WITHDRAWAL OF OIL LANDS—RIGHTS OF PERSONS IN POSSESSION.

In November, 1908, paper locations or declaratory statements were posted by one person in the name of sundry persons claiming the several tracts under the placer mining law, they being at the time vacant, unoccupied mineral lands of the United States. After some transfers and consolidation of claims, the associates entered into a contract with an oil company for the development of one particular property and the oil company under the contract was diligently engaged in work leading to discovery on September 27, 1909, when the land was included in the presidential withdrawal order of that date. Work of development continued after the withdrawal and oil was discovered in December, 1909, involving an expense of a large amount of money. The locations were alleged to be fraudulent and void, because they were made for the purpose of enabling one of the associates to acquire more land in a single location than the law permits. But there could be no reason why the persons succeeding to the rights of the original locators should not be deemed to be bona fide occupants at the date of withdrawal within the meaning of the Pickett Act (act June 25, 1910, 36 Stat. 847, Comp. Stats. Secs. 4523–4525), where they innocently obtained possession in the first instance from some one who was attempting to acquire more land than the law permitted. Their right was not deraigned from, nor did it depend upon a prior location but upon the terms of the Pickett Act. They were occupying and holding in their own right and as persons lawfully entitled to acquire the property under the mining laws. Their possession was not tainted with the fraud of the prior attempted locator whom they did not represent and in whose interest and for whose benefit they were not holding.

United States v. Rock Oil Co., 257 Federal 331, p. 332.

ADVERSE CLAIMS.

TIME FOR FILING—FAILURE TO FILE WITHIN STATUTORY PERIOD.

An adverse claim that was not filed within the period prescribed by the statute can not be considered.

Ebner Gold Min. Co. v. Hallum, 47 Land Decisions 32, p. 33.
See United States Mining Statutes Annotated, 377, 716, 717.

TIME FOR FILING IN ALASKA.

By the Act of June 7, 1910 (36 Stats. 459), adverse vlaims to applications for patents for mining claims in Alaska may be filed at any time during the period of publication or within eight months thereafter.

Ebner Gold Min. Co. v. Hallum, 47 Land Decisions 32, p. 33.

LOSS OF DISCOVERY POINT.

Where by a judgment in an adverse suit an applicant for patent lost that part of his location containing the original discovery, it is essential to entitle him to a patent to the remainder to show a discovery of minerals upon the remaining portion of his claim and that the discovery was made prior to the date of his application for patent.

Star Gold Min. Co., In re, 47 Land Decisions 38, p. 43.

PATENTS.

MINERAL LANDS IN TOWNSITE.

A patent issued under the general townsite laws does not convey the title to any lands known to be valuable for mineral at the date of the townsite entry or to any valid mining claim held under the mining laws at the date of such entry.

Golden Center of Grass Valley Min. Co., In re, 47 Land Decisions 25, p. 27.
See Leland v. Townsite of Saltee, 32 Land Decisions 211.

MINERAL LANDS—LOCATION IN TOWNSITE—HEARING—PRIMA FACIE CASE.

On application for a mineral patent by a claimant of land included in a townsite the claimant is entitled to a hearing as to the mineral character of the land when he makes a prima facie showing to the effect that the land was known to be mineral or was held under a valid mineral location at the time of the townsite entry.

Golden Center of Grass Valley Min. Co., In re, 47 Land Decisions 25, p. 27.

FAILURE OF PROOF TO SHOW DISCOVERY WITHIN LOCATION.

A patent for a mining claim will not issue where the land upon which are situated the discovery shaft and improvements is excepted therefrom and the proof fails to show the existence of mineral on the claim as entered.

Star Gold Min. Co., In re, 47 Land Decisions 38, p. 42.
See Antediluvian Lode & Millsite, In re, 8 Land Decisions 602.
Lone Dane Lode, In re, 10 Land Decisions 53.

LOSS OF PART OF CLAIM—MINERALS WITHIN LIMITS OF CLAIM.

The fact that a patented subsequently located mining claim included the original discovery on which a prior claim was based did nor necessarily defeat the right of the first locator to a patent to the remainder of his claim, if other veins had been discovered on such remaining portions and if there was no actual intent to abandon the remaining part of the claim.

Star Gold Min. Co., In re, 47 Land Decisions 38, p. 41.

CONFIRMATION OF MINERAL ENTRY.

An entry under the mining laws is not one made under the homestead law, timber culture, desert land, or preemption, law, and is not within the proviso to Section 7 of the act of March 3, 1891 (26 U. S. Stats. 1095).

Parmer, In re, 47 Land Decisions 16.

POTASH WITHDRAWALS.

Section 1 of the Act of July 17, 1914 (38 Stats. 509), permits of the entry of lands withdrawn or classified as potash, " with a view of obtaining or passing title with the reservation to the United States of the deposits on account of which the lands were withdrawn or classified or reported as valuable together with the right to prospect for, mine, and remove the same." Section 2 provides that the patent shall contain reservations to the United States of the deposits on account of which the lands patented were withdrawn or classified.

Instructions, In re, 47 Land Decisions 21.

POTASH LANDS NOT EMBRACED IN LEASES.

Under the act of October 2, 1917 (40 Stats. 297), the surface of public lands in and adjacent to Searls' Lake, California, classified as valuable for potash and not embraced in any existing leases, may be patented with the reservation of the mineral deposits to the United States.

Instructions, In re, 47 Land Decisions 21, p. 23.

APPLICATION FOR MILLSITE—NOTICE—PRESUMPTION.

The effect of a notice of an application for a patent for a millsite is, in the absence of an adverse claim duly filed, to give rise to the presumption that no adverse claim exists and that the applicant is entitled to a patent.

Ebner Gold Min. Co. v. Hallum, 47 Land Decisions 32, p. 34.
See United States Mining Statutes Annotated, 436.

MILL SITE.

APPLICATION FOR PATENT.

Application for a patent for a mill-site claim may be embraced and included in an application for a patent for the vein or lode with which the mill site is used or occupied for mining or milling purposes.

Ebner Gold Min. Co. v. Hallum, 47 Land Decisions 32, p. 34.
See United States Mining Statutes Annotated, 597.

NOTICE OF APPLICATION—EFFECT.

Notice of the application for a mill site must be accorded the same force and effect as would be given a notice for an application for a vein or lode.

Ebner Gold Min. Co. v. Hallum, 47 Land Decisions 32, p. 34.

ADVERSE PROCEEDINGS.

Mill sites have been recognized as proper subjects for adverse proceedings and adverse suits respecting them will be determined by the courts.

Ebner Gold Min. Co. v. Hallum, 47 Land Decisions 32, p. 35.
See Durgan v. Redding, 103 Federal 914.
Shafer v. Constans, 3 Mont. 369.
Cleary v. Shiffich, 28 Colo. 362, 62 Pacific 59.
Helena, etc., Co. v. Daly, 36 Land Decisions 144 (explained).

CONFLICTING RIGHTS—ADVERSE PROCEEDINGS.

A person claiming an adverse interest in a mill site must, in order to protect his rights, give the required notice and institute adverse proceedings in the proper court within the statutory period. Such proceedings properly instituted constitute a bar to further action by the Department until the adverse claim has been decided.

Ebner Gold Min. Co. v. Hallum, 47 Land Decisions 32, p. 35.

STATUTES RELATING TO MINING OPERATIONS.

CONSTRUCTION, VALIDITY AND EFFECT.

"PERSONAL" INJURY—"INJURIES RESULTING IN DEATH"—MEANING.

The statute of Arkansas (Acts 1909, No. 202) provides that no stay shall be allowed upon a judgment for a personal injury or injuries resulting in death caused by negligence or default of another. There is a legal distinction between the meaning of the term "personal injury" and the words "injuries resulting in death." There is nothing in the language of the statute to indicate that the words were used by the legislature in other than their common or legal acceptation. The conjunction "or" between the term "personal injury" and the words "injuries resulting in death," thus join as alternative terms expressing unlike things or ideas, and the words that follow, "caused by negligence or default of another," relate to or modify both terms. It appears that the court intends to hold that the statute does not authorize a stay of a judgment recovered by a miner against a mining company for personal injuries.

Fernwood Min. Co. v. Pluma, —— Ark. ——, 213 Southwestern 397, p. 398.

DUTIES IMPOSED ON OPERATOR.

DUTIES—AUTHORITY.

The statute of Illinois imposes the duty upon the mine examiner to visit the working places of the miners and to sound the roof with a sounding rod and to place a conspicuous mark on the coal. If a dangerous condition exists in a working place in a mine, the mine examiner has no authority to determine that the place is not dangerous contrary to the fact, and the mine operator can not excuse himself for a failure on the part of the mine examiner to mark the place on that ground.

Elchorn v. St. Louis & O'Fallon Coal Co., —— Ill. ——, 123 Northeastern 603, p. 605.

See El Dorado Coal Co. v. Swan, 227 Ill. 586, 81 Northeastern 691.

INSPECTION OF MINE—MARKING DANGEROUS PLACES.

A miner was killed by a fall of rock from the roof of the mine where he was loading coal into a car. On the trial of the action for damages the evidence showed that on the morning of the accident and on the day following the firing of shots in the miner's working place the mine examiner inspected the room and left his visitation mark, but made no mark of a dangerous condition. The examiner sounded the roof with the sounding rod the statute requires a mine examiner to use, and marked the place. Under this evidence, to justify a recovery, it must be proved that a dangerous condition existed at the time of the visit of the mine examiner and that he wilfully failed and omitted to make the mark required by the statute as a warning for miners to keep out.

Eichorn v. St. Louis & O'Fallon Coal Co., —— Ill. ——, 123 Northeastern 603, p. 604.

CONSTRUCTIVE NOTICE OF GASEOUS CONDITIONS.

Where a portion of a mine was found to be gaseous and was closed for some 10 days before operations were resumed the lapse of time is sufficient to bring home constructive notice to the operator of the gaseous condition of the mine and to render him liable for the death of a miner caused by an explosion of gas produced by a spark from an electric locomotive.

Jaras v. Wright, —— Pa. ——, 106 Atlantic 798, p. 800.
See Watson v. Monongahela River Consol. Coal & Coke Co., 247 Pa. 469, 93 Atlantic 495.
McCollom v. Pennsylvania Coal Co., 250 Pa. 27, 95 Atlantic 380.

DUTY OWING TO MINER.

The Pennsylvania Mining Act of 1911 (P. L. 798), imposes upon mine operators the duty of not operating electric locomotives through any gaseous portions of a mine; as the statute imposes this duty upon an operator, the operator in turn owes to the miner a duty of not so running electric locomotives. Under this statute a mine operator was liable for the death of a miner caused by an explosion of gas from an electric spark produced while running an electric locomotive through a gaseous portion of a mine.

Jaras v. Wright, —— Pa. ——, 106 Atlantic 798, p. 799.

STATUTE REQUIRING BATHHOUSE — CONSTRUCTION — COMPLIANCE WITH STATUTE.

The statute of Oklahoma (Session Laws 1913, Chap. 125) requires all coal-mine operators, where 10 or more miners are employed, to provide a suitable building of sufficient size to accommodate the miners employed and to provide the same with lockers, lights, heat, hot and cold water and shower baths, and to maintain the same in good and sanitary condition. A mine operator constructed such a bathhouse with the entire floor of concrete and with a basin about

6 feet square gradually sloping to the center and some 6 inches lower in the center than at the outer edge with a drain pipe in the center of the basin for drainage. A miner, while taking a shower bath, slipped and fell upon the concrete floor breaking his arm and sustaining permanent injuries, for which he sued. The bathhouse was constructed and maintained in substantial compliance with the statute, and there was nothing to show that the basin was so constructed as not to be reasonably safe to an ordinarily prudent person and it was free from the appearances of danger to an ordinarily prudent person using it for bathing purposes. Under such state of facts there could be no recovery against the mine operator.

Rock Island Coal Min. Co. v. Taylor, —— Okla. ——, 182 Pacific 81, p. 82.

VIOLATION BY OPERATOR.

WILFUL FAILURE TO COMPLY—MEANING.

A wilful failure to comply with the Illinois mining statute as used in the statute means a conscious failure to perform a duty enjoined by the statute. No question of good faith or bad faith, goor intent or evil intent is involved, but if there is a conscious failure to make the examination required by the statute or to mark a dangerous condition when found, the mine operator is liable for any resulting injury.

Eichorn v. St. Louis & O'Fallon Coal Co., —— Ill. ——, 123 Northeastern 603, p. 604.

See Mertens v. Southern Coal Co., 235 Ill. 540, 85 Northeastern 743.
Peebles v. O'Gara Coal Co., 239 Ill. 370, 88 Northeastern 166.

WILFUL FAILURE TO COMPLY WITH STATUTE.

The mining statute of Illinois imposes certain duties upon a mine operator and makes him liable for a wilful failure to comply with its terms. The statute requires a mine examiner to inspect or examine the working places and make a visitation mark on the coal. Where a mine examiner made a proper examination and left his visitation mark and no dangerous condition was discoverable by such examination, there was not a wilful failure to make an examination and mark dangerous conditions.

Eichorn v. St. Louis & O'Fallon Coal Co., —— Ill. ——, 123 Northeastern 603, p. 604.

MARKING DANGEROUS PLACES—MISTAKE IN JUDGMENT.

A mine operator's liability under the Illinois statute does not rest upon the ground that there was any good faith or bad faith, or that there was no danger in the mine, but upon the ground that he has, knowing the facts which make the mine dangerous, failed to have the statutory marks properly placed in the mine. When a mine operator is advised of the conditions in the mine, he must place, if it is dangerous, statutory marks, and if he fails to do so he acts on his own responsibility and can not excuse himself because he or his mine examiner or manager thought the mine safe.

Eichorn v. St. Louis & O'Fallon Coal Co., —— Ill. ——, 123 Northeastern 603, p. 605.

See Aetitus v. Spring Valley Coal Co., 246 Ill. 32, 92 Northeastern 579, 138 Am. St. 221.

WANT OF LEGAL EXCUSE.

There is no legal excuse on the part of a mine operator for a failure to obey the absolute statutory requirement prohibiting the running of electric locomotives through the gaseous portions of a mine.

Jaras v. Wright, —— Pa. ——, 106 Atlantic 798, p. 800.

KNOWLEDGE OF NATURE AND CONDITION OF ROOF.

The fact that a mine examiner examined the roof of a miner's working place and tested it with a sounding rod as required by the statute and marked the place as safe, was not, as a matter of law, sufficient to relieve the mine operator from liability where the evidence showed that the slate in the roof was brittle and of a kind, character and composition which is liable to fall at any time without notice, although it may appear to be solid; that sometimes loose slate of that kind would fall after the coal had been taken out and sometimes it woud not; that it was what was called "rotten" slate that might stay up for some time or fall without warning, and that there was always danger of its falling. This evidence showed the condition of the roof where the slate although solid was liable to fall at any time, and therefore the condition was dangerous.

Eichorn v. St. Louis & O'Fallon Coal Co., —— Ill. ——, 123 Northeastern 603, p. 606.

NEGLIGENCE OF OPERATOR AND MINE FOREMAN.

A mine operator is liable for the violation of a statute where the injury complained of was caused by the concurring negligence of the operator and of the mine foreman.

Jaras v. Wright, —— Pa. ——, 106 Atlantic 798, p. 800.

EXPLOSION FROM ELECTRIC SPARK.

The Pennsylvania Mining Act of 1911 (P. L. 798), prohibits electric haulage by locomotives operated from trolley wires in any gaseous portions of mines except upon intake air. A violation of this statute in permitting the running of a trolley pole along a highly charged trolley wire through a gaseous portion of a mine by which an explosion occurred, causing the injuries complained of must be regarded as the proximate cause of the injuries for which the mine operator is liable.

Jaras v. Wright, —— Pa. ——, 106 Atlantic 798, p. 799.

SUPERIOR—OBEDIENCE TO ORDERS.

MINER OBEYING ORDERS—PROXIMATE CAUSE.

The statute of Alabama (Code 1907, sec. 3910) gives a miner the right to recover for injuries received while obeying orders from a superior. The orders of any such superior in the obedience of which a miner is injured must have been negligently given and the obedience on the part of the miner must have been the proximate cause of the resulting injury. Under this rule an electrician was not entitled to recover for injuries, where while riding on a car in a mine he was directed by a superior to alight at a certain point and in obedience to the order he alighted safely from the moving car, but the superior while himself alighting from the car was caught by a projecting bolt and thrown against the electrician, knocking him down and under the car, by reason of which he received the injuries complained of. The obedience on the part of the electrician to the order of the superior was clearly not the proximate cause of the injuries complained of and he could not recover under a charge of obeying the negligent order of his superior.

Woodward Iron Co. v. Gamble, —— Ala. ——, 81 Southern 810, p. 811.

FELLOW-SERVANT RULE—DEFENSE ABROGATED.

FELLOW-SERVANT RULE—CHANGE BY STATUTE.

The rules respecting an employer's responsibility to one employee for the negligence of another are subject to legislative change.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 553, p. 556.

DEFENSE ABOLISHED.

A coal-mine operator who has not elected to operate under the Kentucky Workmen's Compensation Act can not defend an action for damages by an injured miner on the ground of the negligence of a fellow servant.

West Kentucky Coal Co. v. Smithers, —— Ky. ——, 211 Southwestern 580.

EFFECT ON CONTRIBUTORY NEGLIGENCE.

STATUTORY REGULATION.

The rules respecting contributory negligence are subject to legislative change and an employer may be deprived of such defense.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 553, p. 556.

LEGISLATURE MAY ABOLISH CONTRIBUTORY NEGLIGENCE AS A DEFENSE.

The legislature may abolish or modify the technical defense of contributory negligence without transcending any constitutional guaranty.

Shea v. North-Butte Min. Co., —— Mont. ——, 179 Pacific 499, p. 503.

DEFENSE ABOLISHED.

A coal mine operator who has not elected to operate under the Kentucky workmen's compensation act can not defend an action for damages by an injured miner on the ground of contributory negligence.

West Kentucky Coal Co. v Smithers, —— Ky ——, 211 Southwestern 580.

KNOWLEDGE OF DANGER—REMAINING IN EMPLOYMENT.

Under the statute of Alabama (Section 3910 Code) a miner merely remaining in the service of a mine operator with knowledge of a dangerous condition does not make him guilty of contributory negligence. But the statute does not mean that the employee may not be guilty of contributory negligence, such as to prevent his recovery as for negligence under the statute; but it provides that merely remaining in the service after the knowledge of the defect or negligence causing the injury shall not prevent a recovery. Other acts, or even omissions to act may constitute contributory negligence under the statute as well as any other cases of negligence. The statute does not and was not intended to abolish or deny the defense of contributory negligence.

S. S. Steel & Iron Co. v. White, —— Ala. ——, 82 Southern 96, p. 97.

EMPLOYERS' LIABILITY ACT—PLEADING.

A motorman in a mine was injured while operating an electric car by reason of a switch being improperly turned. His complaint for damages was sufficient where it alleged that the defendant, its agents and servants, negligently turned the switch. Under the Texas employers' liability act (Vernons Sayles Ann. Stats. 1914, Arts. 5246h et seq.) a mine operator who is subject to the act but who is not qualified is denied the defense of the negligence of a fellow servant, and therefore no allegation was required to the effect that the employee who turned the switch was acting within the scope of his employment.

Texas & Pacific Coal Co. v. Sherbley, —— Tex. Civ. App. ——, 212 Southwestern 758, p. 760.

EFFECT ON ASSUMPTION OF RISK.

POWER OF LEGISLATURE TO ABOLISH DEFENSE.

The legislature may abolish or modify the technical defense of assumption of risk without transcending any constitutional guaranty.

Shea v. North-Butte Min. Co., —— Mont. ——, 179 Pacific 499, p. 503.

DEFENSE ABOLISHED.

A coal mine operator who has not elected to operate under the Kentucky workmen's compensation Act can not defend an action for damages by an injured miner on the ground that the miner assumed the risk.

West Kentucky Coal Co. v. Smithers, —— Ky. ——, 211 Southwestern 580.

KNOWLEDGE OF DANGER—REMAINING IN EMPLOYMENT.

The statute of Alabama (Section 3910 Code) provides that in no event shall the servant be held to have assumed the risk by remaining in the service after knowledge of the defect unless it was the servant's duty to remedy the defect.

S. S. Steel & Iron Co. v. White, —— Ala. ——, 82 Southern 96, p. 97.

RISK ASSUMED BY EMPLOYER—INDEMNITY.

The Arizona Workmen's Compensation Act provides that the consequences of a personal injury to an employee attributable to the inherent dangers of the occupation shall be assumed not wholly by the particular employee upon whom the personal injury happens to fall; but to the extent of compensation in money awarded in a judicial tribunal according to the ordinary processes of law the risk shall be assumed by the employer, and leave the employer to charge it up, so far as he can, as a part of the cost of his product and to make allowance for it, so far as he can, in a reduced scale of wages. The state legislature has come to this resolution in the course of regulating the conduct of those hazardous industries in which human beings in the pursuit of a livelihood must expose themselves to death or to physical injuries more or less disabling, with consequent impoverishment, partial or total, of the workman or those dependent upon him. The rule being based upon reasonable grounds affecting the public interest, being established in advance and applicable to all alike under similar circumstances, there is no infringement of the fundamental rights protected by the fourteenth amendment.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 533, p. 558.

COMPENSATION—RATE OF WAGES.

An employer, if required by statute to assume the pecuniary loss arising from injury to an employee, may take this into consideration in fixing the rate of wages. In addition to this he has an opportunity which the employee has not to charge any such loss as a part of the cost of the product of the industry.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 553, p. 557.

EMPLOYERS' LIABILITY ACTS.

ARIZONA EMPLOYERS' LIABILITY LAW—CONSTRUCTION AND CONSTITUTIONALITY.

The Arizona Employers' Liability law is not unconstitutional on the ground that it deprives an employer of property without due process of law, or because it denies to him the equal protection of the law, on the ground that it imposes a liability without fault and without equivalent protection.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 553, p. 556.

EMPLOYERS' LIABILITY ACT—POWER OF LEGISLATURE.

The rules of law concerning the employer's responsibility for personal injury or death of an employee arising in the course of employment are not beyond alteration by the legislature in the public interest. No person has a vested right entitling him to have these any more than other rules of law remain unchanged for his benefit. Excluding arbitrary and unreasonable changes, liability may be imposed upon an employer without fault and the rules respecting his responsibility to one employee for the negligence of another and respecting contributory negligence and assumption of risk are subject to legislative change.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 553, p. 556.

ARIZONA EMPLOYERS' LIABILITY LAW—CONSTITUTIONALITY—NOVELTY OF LAW.

The fact that the Employers' Liability Act of Arizona is novel in its extensive scheme for compensating injuries does not render it unconstitutional. The novelty is not a constitutional objection since under constitutional forms of government each State may have a legislative body endowed with authority to change the laws. The States are left with a wide range of legislative discretion notwithstanding the fourteenth amendment.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 553, p. 555.

ARIZONA EMPLOYERS' LIABILITY ACT—LIMITATION ON LIABILITY—DUE PROCESS OF LAW.

The responsibility of an employer under the Arizona Employers' Liability Act is not unlimited except as it is true of every action for compensatory damages where the amount varies in accordance with the nature and extent of the damages for which compensation is made. The fact of the danger of juries returning extravagant verdicts has a corrective in the authority of the court to set them aside. It can not be urged against the validity of this law that in submitting a controversy between litigants to the courts for trial according to long established modes and with a constitutional jury to determine the facts and assess compensatory damages there is a denial of "due process of law."

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 553, p. 557.

BURDENS OF HAZARDOUS OCCUPATIONS—POWER OF STATE TO IMPOSE.

The rule of the common law requiring an employee to assume all consequences of personal injuries arising out of the ordinary dangers and normal conditions of a hazardous occupation and to secure his indemnity in advance in the form of increased wages is incompatible with the public interest because the probability of injury occurring to a particular employee, and the nature and extent of such injuries are so contingent and speculative that it is impracticable for either the employer or employee approximately to estimate in advance how much allowance should be made for them in the wages to be paid; and were the proper allowance made it is not to be expected that the average working man will set aside out of his wages a proper insurance against the time when he may be injured or killed. So thus recognizing that injuries to workmen constitute a part of the unavoidable cost of hazardous industries the State may require that it be assumed by the one in control of the industry as employer just as he pays other items of costs. The State may provide by statute that an employer shall not make profit from the labor of his employees and leave the injured ones and the dependents of those whose lives are lost, through accidents due to the conditions of the occupation, to be a burden upon the public.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 553, p. 557.

HAZARDOUS OCCUPATION—CONSTITUTIONALITY—WHO MAY QUESTION.

The Arizona Employers' Liability Act is expressly made applicable to hazardous occupations. The fact that the act may be extended by construction to nonhazardous occupations is a question that can not be raised by a mine operator whose occupation by the act is expressly declared to be hazardous and which is undisputably hazardous. But aside from this employers in nonhazardous industries are in little danger from the act as it imposes liability only for accidental injuries attributable to the inherent dangers of the occupation.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 553, p. 559.

COMPENSATION—METHOD OF AWARDING—VALIDITY OF STATUTE.

Where a State recognizes or establishes a right of action for compensation to injured workmen upon grounds not arbitrary or fundamentally unjust, the question whether the award shall be measured as compensatory damages are measured at common law, or according to some prescribed scale reasonably adapted to produce a fair result is for the State itself to determine. Whether the compensation should be paid in a single sum after judgment is recovered as required by the Arizona Employers' Liability Act as under the common law system in the case of a judgment based upon negligence, or whether it would be more prudent to distribute the award by installment payments is likewise for the State to determine. The fact that the Arizona Employers' Liability Law permits a recovery in an action in the form of compensatory damages and deprives an employer of certain defenses, does not render the act unconstitutional.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 553, p. 558.

RESPONSIBILITIES OF EMPLOYERS—POLICE REGULATIONS.

The State may prohibit and punish self-maiming and attempts at suicide and may prohibit a man from bartering away his life or personal security; and the authority to prohibit contracts made in derogation of a lawfully established policy of the State respecting compensation for actual death or disabling personal injuries is equally clear. One ground of the State's concern with the continued life and earning power of an individual is its interest in the prevention of pauperism with its comitants of vice and crime. Laws regulating the responsibilities of employers for the injury or death of employees arising out of employment bear so close a relation to the protection of the lives and safety of those concerned that they properly may be regarded as coming within the category of police regulations.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 553, p. 557.

APPLICATION—FIVE MEN LAW.

Where the uncontradicted evidence showed that at the time of an injury to a miner, the mine operator was working 250 or more miners, an instruction to the effect that if the coal company was employing five or more men in its business of coal mining then the employers' liability act applied to the case, is not erroneous.

Deep Vein Coal Co. v. Ward, ——— Ind. App. ———, 123 Northeastern 228, p. 229.

ARIZONA EMPLOYERS' LIABILITY LAW—CONSTRUCTION—ASSUMPTION OF RISK.

The Arizona Employers' Liability Law, in respect to certain specified employments designated as inherently hazardous to workmen imposes upon the employer, without regard to the question of his fault or that of any person for whose conduct he is responsible and liable in compensatory damages, excludes all such as are speculative or punitive for accidental injury or death of an employee arising out of and in the course of the employment and due to a condition or conditions of the occupation, in cases where such injury or death shall not have been caused by the negligence of the employee. The statute in effect requires the employer instead of the employee to assume the peculiar risks of injury or death of the employee attributable to hazards incident to the employment and due to its conditions and not to the negligence of the employee killed or injured. The matter of the assumption of risks of employment and the consequences to flow therefrom have been regulated by the common law with statutory modification, but these rules of law are not placed by the fourteenth amendment beyond the reach of the State's power to alter them as rules of future conduct and tests of responsibility through legislation designated to promote the general welfare so long as it does not interfere arbitrarily and unreasonably and in defiance of natural justice with the rights of employers and employees to agree between themselves respecting the terms and conditions of employment.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 533, p. 556.

ASSUMPTION OF RISK—REMAINING IN SERVICE.

Under the Alabama Employers' Liability Act it can not be held in any event that an injured servant assumed the risk of known dangers by remaining in the service after knowledge of defects in the ways, works, and machinery, unless it was the duty of the servant to remedy the defect.

S. S. Steel & Iron Co. v. White, —— Ala. ——— 82 Southern 96, p. 97.

CONTRIBUTORY NEGLIGENCE—BURDEN OF PROOF.

Under the Employers' Liability Act of Alabama, the burden of proof on the issue of contributory negligence is on the mine operator.

S. S. Steel & Iron Co. v. White, —— Ala. ——— 82 Southern 96, p. 97.

DEFENSES ABOLISHED.

Under the Employers' Liability Act of Texas, an employer and a coal mine operator who is subject to the act but who has not qualified, is denied the defense of contributory negligence, negligence of a fellow employee, or assumed risk.

Texas & Pacific Coal Co. v. Sherbley, —— Tex. Civ. App. ——, 212 Southwestern 758, p. 760.

EMPLOYMENT OF INCOMPETENT SERVANTS—KNOWLEDGE OF INCOMPETENCY.

In order for an injured miner to recover from a mine operator for negligence in the employment of an inexperienced and incompetent employee, it is necessary to allege and prove that the mine operator knew of the inexperience and incompetency of the employee, or that he should have known of it.

Texas & Pacific Coal Co. v. Sherbley, —— Tex. Civ. App. —— 212, Southwestern 758, p. 760.

INCOMPETENCY AND INEXPERIENCE—LIABILITY.

A coal mine operator is liable under the Texas employers' liability act for the negligent acts of his employees committed within the scope of their authority, regardless of any care used in selecting the employees, and recovery may be had for the negligence of the employer in hiring an inexperienced and incompetent employee.

Texas & Pacific Coal Co. v. Sherbley, —— Tex. Civ. App. ——, 212, Southwestern 758, p. 760.

DEFECTS IN WAYS, WORKS, AND MACHINERY.

A complaint in an action under the Alabama Employers' Liability Act claimed damages as for a defect in the ways, works, machinery, etc., of the defendants' ore mine. The defect complained of was thus described: "Said overhead timber was defective and said defect consisted in this—said timber had been permitted to sag or hang down and protrude over the track." The evidence tended to prove the allegation and that it proximately contributed to the injuries complained of and was sufficient to entitle the plaintiff to recover damages.

S. S. Steel & Iron Co. v. White, —— Ala. ——, 82 Southern 96, p. 97.

NEGLIGENCE OF OPERATOR AND OF MINE BOSS—PLEADING.

A complaint by a miner for damages for injuries received while working in a mine proceeded upon the theory that the injury was the result of the negligence of the mine operator. The negligence of the mine boss and of the day men, whose duty it was to remove slate and other material from the roof of the mine where the miner worked, was negligence for which the mine operator was liable.

Deep Vein Coal Co. v. Ward, —— Ind. App. ——, 123 Northeastern 228, p. 230.

ORDERS OF EMPLOYER—PLEADING.

The Employers' Liability Act of Indiana (act 1911, p. 145) makes no distinction between general and special orders; and in an action by a miner for injuries, it is not necessary for the complaint to aver or in any manner show whether the order alleged was general or special. It is sufficient to aver that the plaintiff was performing his duties under the order or by the instructions of the mine operator.

Fauvie Coal Co. v. Kushner, —— Ind. ——, 123 Northeastern 409, p. 412.
See Vivian Collieries Co. v. Cahall, 184 Ind. 473, 110 Northeastern 672.

DAMAGES—RECOVERY—RULE IN TORT ACTIONS.

The Employers' Liability Act of Arizona is not invalid because the recovery of damages in actions for injuries or death are governed by the rules governing actions of tort and may include disfigurement and bodily or mental pain. Whether these latter elements do or do not constitute an economic loss in the sense of diminished power to produce they are as much part of the workman's loss as the loss of a limb. It is true that pain can not be shifted to another. Neither can the loss of a leg. But one can be paid for as well as the other.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 553, p. 559.

ACTION FOR BENEFICIARIES—RIGHT OF ADMINISTRATOR TO SUE.

The Arizona Employers' Liability Act (Civil Code 1913, paragraph 3158) provides that in case of death of an employee the employer shall be liable to the personal representative of the deceased for the benefit of the widow or husband and children of such employee; and if none, then to such employee's parents. Under this provision an administrator of a deceased employee can not maintain an action in his own name for the use and benefit of the parents of the deceased employee on the theory that he is a trustee of an express trust within the provisions of the Arizona Code. In such case suit must be brought in the name of the parents as the real parties in interest.

Bryan v. Inspiration Consol. Copper Co., —— Ariz. ——, 181 Pacific 577.

INDUSTRIAL COMMISSIONS.

JURISDICTION OF INDUSTRIAL BOARD.

There is no presumption of jurisdiction in favor of the Industrial Board under the Workmen's Compensation Act of Illinois.

Tazewell Coal Co. v. Industrial Commission, —— Ill. ——, 123 Northeastern 28, p. 29.

INDUSTRIAL ACCIDENT BOARD—JUDICIAL POWERS.

Many of the functions of the Industrial Accident Board created by the Montana Workmen's Compensation Act are judicial in character; but the Board is not vested with judicial powers in the sense in which that expression is used in the constitution. The Board does not possess power to decide and pronounce a judgment and carry it into effect between the parties. The Board was created as a purely administrative body and it may hear evidence to enable it to make an award in a particular case and to that end may call and hear witnesses; but it is without power to render enforceable judgments and its determinations and awards are not enforceable by execution or by other process until a judgment has been entered thereon in an application to a regularly constituted court. The Industrial Accident Board is a ministerial and administrative body with incidental quasi judicial powers.

Shea v. North-Butte Min. Co., —— Mont. ——, 179 Pacific 499, p. 503.

WORKMEN'S COMPENSATION ACTS.

OBJECT OF WORKMEN'S COMPENSATION LAWS.

The object of workmen's compensation laws is to substitute for the imperfect and economic wasteful common-law system by private action by an injured employee for damages for negligence on the part of the employer, a system by which every employee in a hazardous industry might receive compensation for any injury suffered by him arising out of and in the course of the employment. Under the common-law action the injured employee could only recover by proof of negligence on the part of the employer and by proof of freedom from contributory negligence on his own part. Under workmen's compensation laws it is not necessary to prove either negligence on the part of the employer or freedom from negligence on the part of an injured employee. The theory of such legislation is that loss occasioned by reason of injury to employees shall not be borne by the employees alone, as under the common-law system, but directly by the industry itself and indirectly by the public. This class of legislation has been formulated after the most patient study and investigation by the most eminent men in professional and industrial walks of life in order to avoid any obstructions or limitations as might be encountered under the written Constitution, and such laws now in force in a great number of the States have in almost every instance been held constitutional.

Shea v. North-Butte Min. Co. — Mont. —, 179 Pacific 499, p. 501.

LIBERAL CONSTRUCTION.

Workmen's Compensation Acts should be liberally construed in order that the humane purposes of their enactment may be realized; and such a construction is to be adopted in determining whether an accident that produced injury arose out of and in due course of the employment.

Granite, Sand & Gravel Co. v. Willoughby, — Ind. App. —, 123 Northeastern 194, p. 195.

ARIZONA LAW—VALIDITY—INSTRUCTION—COMPENSATORY DAMAGES.

The Arizona Workmen's Compulsory Compensation Law together with the Employers' Liability Act limits the recovery for an injury to an employee strictly to compensatory damages. The former act makes no discrimination between employer and employee except such as necessarily arise from their different relation to the common undertaking. Both are essential to it, the one to furnish capital, organization and guidance, the other to perform the manual work; both foresee that the occupation is of such a nature and its condition such that sooner or later some of the workmen will be physically injured or maimed, or one killed occasionally, without particular fault of any one party. The statute requires compensation to be paid to the injured workman or his dependents because it is upon them that the first brunt of the loss falls, and it is to be paid by the employer because he takes the gross receipts of the common enterprise and by reason of his position of control can make such adjustment as ought to be and practically can be made in the way of reducing wages and increasing the selling price of the product in order to allow for the statutory liability. In this respect there is no denial of equal protection of the laws.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 553, p. 557.

CONSTITUTIONALITY OF MONTANA STATUTE.

The constitution of Montana provides in effect that there shall be a judicial remedy for every injury or wrong suffered by one person at the hands of another. This provision means that the courts must be accessible to all persons alike without discrimination and afford a speedy remedy for every injury or wrong recognized by law as being remedial in the court. The term "injury" as used in the constitution means such an injury as the law recognizes or declares to be actionable. This provision is not so binding as to strip the legislature of all power to alter or repeal any portion of the common law relating to accidental injuries or the death of one person by the negligence of another. The legislature can destroy vested rights, and where an injury has already occurred for which the injured person has a right of action, the legislature can not deny him a remedy. But remedies recognized by the common law in this class of cases together with all rights of action to arise in the future may be altered or abolished to the extent of destroying actions for injuries or death arising from negligent accident, so long as there is no impairment of rights already accrued. This conclusion necessarily follows from the established doctrine that no one has a vested right in any rule of the common law. It follows from these principles that the legislature may abolish technical rights of actions arising out of the negligence of an employer. On this theory the Montana statute does not violate the provisions of the State constitution.

Shea v. North-Butte Min. Co., —— Mont. ——, 179 Pacific 499, p. 502.

CONSTITUTIONALITY—EQUAL PROTECTION OF LAW.

The Workmen's Compensation Act of Montana is not unconstitutional on the ground that it violates the clause of the fourteenth amendment to the Constitution of the United States guarantying to the citizens the equal protection of the laws.

Shea v. North-Butte Min. Co., —— Mont. ——, 179 Pacific 499, p. 505.

CONSTITUTIONALITY—DUTIES IMPOSED ON STATE AUDITOR.

The Workmen's Compensation Act of Montana is not unconstitutional because the auditor of State is made a member of the board and is required to execute a bond to guaranty the faithful performance of his duties, on the ground that this constitutes him a public officer in a capacity other than as State auditor. The Constitution prohibits the imposition of duties upon the State auditor that appertain to the legislative or judicial departments of the Government. But this act imposes upon the auditor no duties that appertain to the legislative or judicial departments of the Government and so long as this limitation is not violated the legislature is at liberty to impose any governmental duty upon the officer.

Shea v. North-Butte Min. Co., —— Mont. ——, 179 Pacific 499, p. 504.

ARIZONA WORKMEN'S COMPENSATION ACT—PERSONAL INJURY—SYSTEMS OF RECOVERY.

An employee injured in the course of his employment has open to him three avenues of redress: (1) The common law liability, relieved of the fellow-servant defense and in which contributory negligence and assumption of risk are questions for the jury; (2) the employers' liability law which applies to hazardous occupations where the injury or death is not caused by his own negligence; (3) the compulsory compensation law, applicable especially to dangerous occupations by which compensation is granted without fault upon the part of the employer. The fact that the compensation act limits the recovery is never resorted to unless the employee has been negligent and is thereby debarred of a remedy under the employers' liability act. But the State may abolish contributory negligence or assumption of risk as a defense and the election of remedies is an option frequently given to a person entitled to an action. The right of an election of remedies can not be said to deprive employers of property without due process of law or to deny them equal protection because it confers upon an employee a free choice among several remedies.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 553, p. 559.

ALASKA WORKMEN'S COMPENSATION ACT—NAMES OF BENEFICIARIES FURNISHED EMPLOYMENT AGENT.

The Workmen's Compensation Act of Alaska requires an employee to furnish to the employer a written statement showing the names of persons entitled to the benefits in case of his death. The statutue is sufficiently complied with in this respect where an employee at the time of his employment furnished an employment agent with the required statement, although such person was a common employment agent of the employer company and of other mining companies.

Alaska Treadwell Gold Min. Co. v. Cranis, 255 Federal 810, p. 812.

EMPLOYER'S FAILURE TO NOTIFY BENEFICIARIES OF EMPLOYEE'S DEATH—TIME FOR FILING CLAIMS.

Section 9 of the Workmen's Compensation Act of Alaska (Session Laws 1915, p. 146), provides that the employee shall furnish the employer a written statement showing the names of the persons who would be entitled to benefits under the act in case of his death. On the death of an employee it is made the duty of the employer to notify each beneficiary named in the statement given of the fact of the employee's death. The failure of an employee to give the required statement does not forfeit the right of a beneficiary to the benefits under the statute but it relieves the employer of all obligation to give to any of the beneficiaries notice of the death of the employee. But if the proper statement was furnished and the employer, on the death of the employee, failed to notify the beneficiaries named within the time and manner prescribed, the beneficiaries who have not been so notified may file claims and prosecute actions for the recovery of the sum due them after the expiration of the statutory period in which they would otherwise have been required to present their claims.

Alaska Treadwell Gold Min. Co. v. Cranis, 255 Federal 810, p. 813

CONSTRUCTION OF PIPE LINE—COMPANY SUBJECT TO STATE LAWS.

A pipe line company transported natural gas for domestic and foreign consumption through the same line to certain points where part was intended for use within the State. The company was engaged in the excavation of a ditch preparatory to laying a gas pipe parallel to its existing line and to be connected therewith for the purpose of increasing its capacity. As to the excavation of such ditch the company was subject unconditionally to the provisions of the West Virginia workmen's compensation act (Laws 1915, Chap. 9), and was liable for injuries to an employee working in such ditch whose injury was caused by the negligence of a fellow servant.

Roberts v. United States Fuel Gas Co., —— W. Va. ——, 99 Southeastern 549, p. 551.

ELECTION BY EMPLOYEE—POWER TO REPUDIATE.

The Workmen's Compensation Law of Montana (chap. 96, Laws 1915) declares that when both the employer and employee have elected to be bound by the act, its provisions shall be exclusive and such election is a surrender by both of their rights to adopt any other method, form, or kind of compensation, or cause of action either at law or at equity. When an employee has elected to become subject to the provisions of the Workmen's Compensation Law, he can not thereafter repudiate such election and prosecute an action for damages.

Shea v. North-Butte Min. Co., —— Mont. ——, 179 Pacific 499, p. 502.

PRESUMPTION AS TO EMPLOYEE'S ELECTION.

The Workmen's Compensation Act of Montana is elective. It points out the particular method by which both employer and employee shall indicate their election. It also provides that where an employer has made his election as prescribed, the employee shall be presumed to have elected to be subject to it and under the plan stated by the employer, unless he shall affirmatively elect not to be so bound. The silence of the employee after the election by the employer establishes a presumption that he elects to be subject to the act. It is clearly within the province of the legislature to establish presumptions and rules relating to the burden of proof and a statute establishing a presumption of this character is valid so long as the presumption is not unreasonable and is not conclusive of the rights of the parties.

Shea v. North-Butte Min. Co., —— Mont. ——, 179 Pacific 499, p. 503.

EMPLOYEE MAY WAIVE BENEFITS.

An injured employee can not complain because of the difference in the modes by which the employer and the employee may indicate their election to be bound by the workmen's compensation act, as it is competent for an employee to waive the advantage of any provision of law which was intended solely for his benefit so long as such waiver does not violate public policy; and an employee may at his option waive in advance the advantage of any remedy established solely for his benefit which the legislature may itself abolish, especially when it has provided a substitute remedy which renders his right to relief absolute.

Shea v. North-Butte Min. Co., —— Mont. ——, 179 Pacific 499, p. 503.

COURSE OF EMPLOYMENT.

An injury occurs in the course of the employment when it is within the period of the employment at a place where the employee may reasonably be and while he is reasonably fulfilling the duties of his employment or is engaged in doing something incidental to it.

Granite, Sand & Gravel Co. v. Willoughby, — Ind. App. —, 123 Northeastern 194, p. 195.

COURSE OF EMPLOYMENT—EMPLOYEE MINISTERING TO HIS WANTS.

The rule is that acts of ministration by a servant to himself, such as quenching his thirst, relieving his hunger, protecting himself from excessive cold, performance of which while at work are reasonably necessary to his health and comfort, are incidents to his employment and such acts of service are within the Workmen's Compensation Acts, although they only indirectly are conducive to the purposes of the employment. The rule was applied in a case where a watchman employed by a mining company was injured while blasting stumps upon the premises in order to procure fuel for the purpose of heating and cooking.

Ocean Accident & Guaranty Corp. v. Pallaro, —— Colo. ——, 180 Pacific 95, p. 96.

INJURIES ARISING OUT OF AND IN COURSE OF EMPLOYMENT.

A watchman was required to reside on the mine premises and to remain thereon during all hours of the day. The company furnished him with a cabin equipped with bedding and a cooking stove but supplied no fuel. No fuel was obtainable nearer than 600 or 700 yards distant, and to secure which he would have to leave the premises. The mine premises were covered with solid pine stumps constituting good fuel. The watchman while blasting some of the stumps with dynamite for the purpose of securing fuel was struck upon the head by a piece of flying wood, the injury causing his death. The Workmen's Compensation Act of 1915 as amended by the act of 1917 provides that if at the time of the accident the employee is performing services arising out of and in course of his employment, he is entitled to compensation. At the time of the injury the watchman was procuring fuel to protect himeslf from cold and for cooking purposes, and this was incident to the employment. The act of procuring fuel was ultimately for the benefit of the employer and was, under the existing circumstances, "arising out of and in the course of the employment."

Ocean Accident & Guaranty Corp. v. Pallaro, —— Colo. ——, 180 Pacific 95, p. 96.

INJURY ARISING OUT OF EMPLOYMENT—ACCIDENT.

A workman was employed and engaged in breaking rock in a quarry with a 16-pound sledge hammer and then to load the rock into a car. The breaking of the rock was hard work, and in order to earn fair wages it was necessary for the workman to work hard. At the noon hour he ate his lunch, seemed to be feeling well, was cheerful and in good spirits, but in the afternoon while at his working place, he was observed to be bending over and streams of blood were gushing from his mouth and nostrils and he died before medical aid could reach him. Shortly before the hemorrhage he was using the heavy sledge hammer on a large rock. These facts are sufficient to indicate an injury by "accident," an injury "arising out of the employment" within the meaning of the Workmen's Compensation Act of Kansas.

Gilliland v. Ash Grove Lime & Portland Cement Co., ——— Kan. ———, 180 Pacific 793.

PRESENTATION OF CLAIM—PRECEDENT—TIME FOR MAKING—CONDITION.

Under the Worken's Compensation Act of Kansas (General Stats. 1915, Sec. 5916), proceedings against a mine operator to recover compensation for an injury by a miner can not be maintained unless the claim for compensation was made within three months after the accident. A demand for compensation within three months is a condition precedent to a right of action under the statute.

Jacobs v. Hamilton Coal & Mercantile Co., —— Kan. ——, 182 Pacific 410, p. 411.

CLAIM FOR COMPENSATION—TIME FOR MAKING—FINDING CONCLUSIVE.

The Workmen's Compensation Act of Kansas (General Stats. 1915, sec. 5960), expressly provides that proceedings for the recovery of compensation shall not be maintainable unless a claim for compensation has been made within three months from the time of the accident. Where in an action by a miner for compensation for injuries under the statute the trial court finds as a fact that a claim for compensation was not made within the statutory time the conclusion is binding upon the court on appeal.

Jacobs v. Hamilton Coal & Mercantile Co., —— Kan. ——, 182 Pacific 410, p. 411.

NOTICE OF CLAIM—CONSTRUCTION.

The Alaska Workmen's Compensation Act (Session Laws 1915, p. 146), requires that the beneficiary or some one in his behalf shall within 120 days from the death of the employee serve a written notice upon the employer that shall contain the name and address of the beneficiary, the relation existing between beneficiary and deceased, and some other matters. It is provided that the notice shall be liberally construed and no claim for compensation denied because of any defect in the notice, if the notice was served with a bona fide intention to comply with the statute. The failure to serve such notice is an affirmative defense in an action by a beneficiary and the beneficiary is not required to justify a recovery to prove that the notice was served.

Alaska Treadwell Gold Min. Co. v. Cranis, 255 Federal 810, p. 811.

INJURED MINER—LUMP SUM ALLOWANCE—RECORD—REVIEW.

The Workmen's Compensation Act of Illinois (Hurd's Rev. Stats. 1917, Chap. 48), provides that when it appears for the best interests of the parties compensation to an injured miner may be paid in a lump sum. The record in such case must show what notice of the proceedings was given the coal-mine operator and must contain the testimony upon which the decision was based in order that the court on review may determine whether there was any evidence fairly tending to sustain the order. A record containing only the conclusion of the industrial Board is not sufficient.

Tazewell Coal Co. v. Industrial Commission, —— Ill. ——, 123 Northeastern 28, p. 29.

INJURY TO LEG—COMPENSATION.

Under the Workmen's Compensation Act of Kansas (Laws 1917, Chap. 226) an injury to a miner's leg may in some instances justify a larger amount of compensation than the loss of the leg, and in such case a court may follow paragraph 19 of section 3 instead of the schedule set forth in paragraph 14.

Close v. Lucky OK Min. Co. —— Kan. ——, 182 Pacific 392, p. 393.

INDUSTRIAL ACCIDENT COMMISSION—AWARD PROCURED BY FRAUD—REMEDY.

A stockholder in a mining corporation purchased a large amount of stock from the widow of a miner who was killed while working in the mine. A part of the consideration for the purchase was an agreement by the widow not to present any claim for damages nor seek to obtain any award as compensation for the death of her husband to be paid by the mining company. After the transfer of the stock the widow filed a claim with and procured an award from the Industrial Accident Commission. The Industrial Accident Commission is a court of limited jurisdiction and is wholly without power or authority in matters of general jurisdiction without the scope of the Workmen's Compensation Act. The petitioner not having been a party to the proceedings before the commission and not having questioned the validity of the award prior to its final adjudication and its affirmance by the court, was wholly without the jurisdiction to hear or determine the matter and could not order a stay of execution on the judgment entered on its award.

Gamble v. Superior Court of Alameda County, —— Cal. App. ——, 179 Pacific 717, p. 718.

AWARD PROCURED BY FRAUD—JURISDICTION OF COURT—INJUNCTION.

The superintendent of a mining company was killed while working in the mine. At the time of his death he owned 12,000 shares of stock of the mining company which subsequently passed to his widow. Another stockholder of the company agreed to purchase the stock for the sum of $7,200 in consideration that the widow would bring no suit and file no claim with the Industrial Accident Commission for an award of damages on account of the death of her husband. After the purchase of the stock was consummated, the widow in violation of the agreement and without the knowledge of the purchaser of the stock filed a claim and obtained an award of $5,000 against the company for the death of her husband. Under these facts the superior court of the county and the judge thereof had jurisdiction to hear an action in form and in the nature of an equitable proceeding to enjoin the widow from proceeding to collect by execution or other process, and the provision of the Workmen's Compensation Act that denies jurisdiction of courts of the State to review, reverse, correct, or annul any order, decision, or award of the commission does not prevent the Superior Court as a court of equity from entertaining jurisdiction and granting such relief as the party may be entitled to.

Gamble v. Superior Court of Alameda County, —— Cal. App. ——, 179 Pacific 717, p. 719.

DEFENSES ABROGATED.

The technical defense of contributory negligence and assumption of risk may be abolished or modified by a workmen's compensation act without transcending any constitutional guaranty.

Shea v. North-Butte Min. Co., —— Mont. ——, 179 Pacific 499, p. 503.

By the workmen's compensation act of West Virginia a mining corporation that is in fault is liable for the negligence of his servants or agents and is denied the defense of assumption of risk.

Roberts v. United Fuel Gas Co., —— W. Va. ——, 99 Southeastern 549, p. 552.

By the workmen's compensation act of West Virginia a mining corporation that is in fault is liable for the negligence of its servants or agents and is denied the defense of contributory negligence.

Roberts v. United Fuel Gas Co., —— W. Va. ——, 99 Southeastern 549, p. 552.

Under the workmen's compensation act of West Virginia a mining corporation is liable for an injury to an employee caused by the negligence of a fellow employee and he is deprived of the fellow servant defense by the express provisions of the statute.

Roberts v. United Fuel Gas Co., —— W. Va. ——, 99 Southeastern 549, p. 552.

CONTRIBUTORY NEGLIGENCE OF EMPLOYEE.

Section 8 of the Colorado Workmen's Compensation Law of 1915 enumerates the conditions which must occur and exist in order to give a right to compensation and freedom from negligence on the part of an employee is not included and therefore negligence is no defense to a claim for compensation. Neither does negligence alone prevent any act ordinarily incident to the employment from being one performed out of and in the course of the employment. A peril that arises from the negligent or reckless manner in which an employee does his work may well be held to be a risk incidental to the employment.

Ocean Accident & Guaranty Corp. v. Pallaro, —— Colo. ——, 180 Pacific 95, p. 97.

VIOLATION OF RULE—CONTRIBUTORY NEGLIGENCE.

Where the miner's injuries were caused by his violation of a rule promulgated by the mine operator, he was guilty of contributory negligence; but under the workmen's compensation act of Kentucky, the defense of contributory negligence is abolished where the mine operator has not elected to operate under the workmen's compensation act.

West Kentucky Coal Co. v. Smithers, —— Ky. ——, 211 Southwestern 580, p. 581.

MINES AND MINING OPERATIONS.

ACTIONS—PLEADING AND PROOF OF NEGLIGENCE.

RECOVERY MUST FOLLOW ALLEGATIONS OF NEGLIGENCE.

In an action by a miner for damages for injuries caused by falling into an ore chute, the allegation of negligence was that the mine operator failed to warn or apprise the plaintiff of the existence of the ore chute into which he fell. The plaintiff was an experienced miner and timberman and at the time of the injury was passing through the mine for the purpose of ascertaining where timbering might be required. He knew of the method of carrying on the mining operations and that there were a large number of ore chutes in the stopes of the mine for the purpose of disposing of the ores and waste material. The law did not impose upon the mine operator the duty to warn or notify the plaintiff respecting the existence of the chute in question, unless the operator thought the plaintiff had no knowledge and did not have the means of knowing that the ore chute was maintained in the condition it was. Under the evidence there could be no recovery for the particular negligence averred, the failure to warn or apprise the plaintiff of the existence of the ore chute.

Macky v. Bingham, New Haven Copper & Gold Min. Co., —— Utah ——, 180 Pacific 416, p. 417.

RELATION OF MASTER AND SERVANT.

ADMISSIBILITY OF PAY ROLL TO PROVE RELATION.

In an action to recover damages for the death of a miner employed in a mine on the issue as to whether the deceased was an employee of the mine operator, a pay roll containing the name of the deceased but which he never signed and which he never saw was not admissible in evidence.

Alaska Treadwell Gold Min. Co. v. Cranis, 255 Federal 810, p. 812.

EMPLOYMENT BY COMMON EMPLOYMENT AGENT.

A mining company as one of several companies having a common employment agent can not defeat a claim for benefits under the

Alaska Workmen's Compensation Act on the ground that the deceased was not in its employ at the time of his death, where the common employment agent assigned the men employed by him to the different mining companies and failed to make it plain to the deceased employee for which company the agent was acting and for which the employee was to work.

Alaska Treadwell Gold Min. Co. v. Cranis, 255 Federal 810, p. 812.

OVERSIGHT RETAINED BY OPERATOR.

The relation of master and servant was fully shown by proof that an employee to whom superintendence was entrusted employed and discharged the miners but that the superintendent and the miners were all under the direction and subject to the orders of the bank boss and that the superintendent and the men under him not only represented the mine operator in the ultimate result of the work but in all the details.

Alabama Fuel & Iron Co. v. Smith, —— Ala. ——, 82 Southern 30, p. 31.

DEVIATION FROM EMPLOYMENT—EFFECT ON RELATION.

Where a servant or an employee so far deviates and disobeys the instructions of the master or employer as to amount to an entire abandonment of the master's service, then the master is not liable for an injury inflicted through the negligence of his servant; but if the deviation is a mere incident to the discharge of a duty which the servant is performing at the time such departure occurs and after the termination of which authorized service is resumed then the master is liable.

Pierce-Fordyce Oil Association v. Brading, —— Tex. Civ. App. ——, 212 Southwestern 707, p. 709.

BURDEN OF PROOF.

A miner suing for damages for injuries received while working in a mine alleged in his complaint that he was employed by the "defendants." Under the allegation that he was the employee of all the defendants, the burden was upon him to so prove. In actions for tort where two or more persons are jointly sued as defendants a recovery may be had against all or against one or more, according to the proof; but the rule does not apply where the action is for a negligent performance or for a negligent failure to perform a duty arising out of a contract whereby injury and damage resulted. In such a case the averment of the contract from which the alleged duty to the plaintiff arose is a material allegation and must be proved as charged.

Coal City Min. Corp. v. Davis, —— Ala. App. ——, 81 Southern 358, p. 359.

LEASE OF MINE WITHOUT CHANGE OF POSSESSION.

A mining company owning a mine with all the equipment for carrying on mining operations leased the mine and equipment to a third person without apparent change of possession, the mining company continuing to pay the employees, without notice of any change in the possession. Under these circumstances, in an action by a miner for damages for injuries, it was a question of fact for the jury to determine who was the employer of the miner at the time of the injury.

Coal City Min. Corp. v. Davis, —— Ala. App. ——, 81 Southern 358, p. 359.
See Amerson v. Corona Coal & Iron Co., 194 Ala. 175, 69 Southern 601.
Sloss-Sheffield Steel & Iron Co. v. Hubbard, 14 Ala. App. 139, 68 Southern 571.
Corona Coal & Iron Co. v. Amerson, —— Ala. ——, 75 Southern 289.

NEGLIGENCE OF OPERATOR.

QUESTION OF FACT.

Where reasonable men might honestly differ in their conclusions, and where the facts set out in a complaint for damages for injuries to a miner are of a character to be reasonably subject to more than one inference or conclusion as to whether negligence on the part of the operator existed, the question is then one of fact for a jury to determine.

Fauvre Coal Co. v. Kushner, —— Ind. ——, 123 Northeastern 409, p. 413.

PROOF SUFFICIENT—VIOLATION OF DUTY.

To establish negligence on the part of a mine operator it is not sufficient for an injured miner to show that there was a violation of duty owing to another person or class of persons which, had it been performed, would have prevented the injury complained of; but it must further appear that there was a violation of a duty owing to the injured person, or to a class to which he bore the necessary relation to make the duty applicable to him.

West Kentucky Coal Co. v. Smithers, —— Ky. ——, 211 Southwestern 580, p. 581.
See Kamonvi v. Consolidated Coal Co., 182 Ky. 683, 206 Southwestern 883.

VIOLATION OF DUTY—PROBABLE RESULTS.

When an employer has violated a duty his liability extends to such injuries as might reasonably be anticipated, under ordinary circumstances, as the natural and probable result of his wrongful act.

Texas & Pacific Coal Co. v. Ervin, —— Tex. Civ. App. ——, 212 Southwestern 234, p. 235.

INJURIES REASONABLY ANTICIPATED.

A mine operator guilty of negligence is responsible for all consequences which prudent and experienced men fully acquainted with all the circumstances, which in fact exist, whether they could have been ascertained by reasonable diligence or not, would at the time of the negligent act have thought reasonably possible to follow if they had occurred to their mind.

Woodward Iron Co. v. Gamble, —— Ala. ——, 81 Southern 810.

FAILURE TO INSPECT AFTER BLAST—QUESTION OF FACT.

A mine operator has not discharged his duty to a mucker where an inspection of the particular raise where the mucker was required to work was made at 6 o'clock, and that afterwards and before the mucker was ordered to the raise to work a blast was fired in the raise and no inspection was made after this blast was fired. Under this evidence the question of the negligence of the operator was one of fact for the jury.

Wooton v. Dragon Consol. Min. Co. —— Utah ——, 181 Pacific 593, p. 594.

INTERVENING AGENCY.

The connection between any negligence charged on the part of a mine operator and an injury complained of by a miner may be broken by an intervening cause or agency, and such connection is to be considered as broken if the intervening event is one which in the natural and ordinary course of things may not reasonably be anticipated.

Woodward Iron Co. v. Gamble, —— Ala. ——, 81 Southern 810, p. 811.

APPLIANCES MAINTAINED BY OPERATOR—PROOF AND PRESUMPTION.

Where an accident resulting in an injury is such as in the ordinary use of appliances does not happen if those who have the management of such appliances use proper care, then proof of the accident and injury affords reasonable evidence, in the absence of explanation by the mine operator, that the accident arose from a want of care. An injured employee under such circumstances need not do anything further than to show that the defect was known to the operator, or that it would have been discovered upon the exercise of reasonable care to ascertain its condition.

Duran v. Yellow Aster Min. & Mill. Co., —— Cal. App. ——, 181 Pacific 395, p. 396.

UNSAFE APPLIANCE—OPERATOR'S KNOWLEDGE—LIABILITY.

A driver of a mine car was injured while using a jack to raise his car to replace it on the tracks. After the jack was set it failed to hold, and the lever flew back, striking and injuring the driver. Proof that another miner had been injured while using the jack and proof that a jack used by another miner had slipped a number of times was not sufficient to show knowledge on the part of the mine operator of the defective condition of the jack, where the evidence did not disclose that the first miner was injured through some fault of his own and not that the jack was defective and where there was nothing to show that the jack that slipped many times when used by another miner was the same that caused the injury.

Howell v. Stearns Coal & Lumber Co., —— Ky. ——, 212 Southwestern 463.

KNOWLEDGE OF UNSAFE CONDITION—ROOF OF MINE.

A room in a mine had remained unworked for a period of one year. The exposure to the air necessarily weakened the roof. The operator intending further operations in the room had it examined by the foreman and additional props placed by timbermen employed for that purpose. While engaged in this work the timbermen discovered several cracks in the roof and discussed the advisability of using a "header" or "cross bar" to support a portion of the roof and the plan would have been adopted had the necessary timber been at hand. A header consists of timber from four to six inches square and ten to twelve feet long, placed across the weak portion of a roof supported by upright posts at the ends, leaving space between for operating a cutting machine. The situation called for the roof being supported by headers, and it was negligence on the part of the operator to order a machine operator to work under the dangerous roof.

Consolidated Coal Co. v. Marcum, 257 Federal 287, p. 289.

FAILURE TO MAKE BREAKTHROUGHS—LIABILITY.

A mine operator can not be held liable on the ground of negligence in an action by a shot firer for damages for injuries for failure to make breakthroughs at shorter intervals than 40 feet, the distance that was suggested by the shot firer himself at the time the breakthroughs were located.

Parocca v. Missouri, K. & T. R. Co., —— Kan. ——, 180 Pacific 270.

CONSTRUCTION OF BATHHOUSE—INSUFFICIENT PROOF.

A mine operator, pursuant to the statute of Oklahoma, constructed a building for a shower bath and maintained the same according to the statutory requirements. The floor of the room was made of concrete and in the center there was a basin some 6 feet square gradually sloping toward the center and about 6 inches lower in the center than at the outer edge. The pipe for letting on the shower was immediately over the center of the basin and the basin was drained with a pipe from that point. A miner while taking a bath slipped and fell upon the concrete floor, breaking his arm and sustaining permanent injuries for which he sued. In such a case the question of actionable negligence rests upon the margin of difference between a basin of just slope enough to make it sanitary by draining off the water and soap and a slope which this one had. There was no proof that the construction of the basin was essentially different from the ordinary manner of constructing such basins nor was there proof that it was any steeper than required by the statute to make it sanitary. In the absence of proof of any violation of the statute and of any actionable negligence the mine operator was not liable in damages to the injured miner.

Rock Island Coal Min. Co. v. Taylor, —— Okla. ——, 182 Pacific 81, p. 82.

GAS COMPANY MAINTAINING BROKEN PIPE.

A gas company may be charged with actionable negligence in turning gas into a service pipe although the service pipe had been severed or disconnected without its knowledge leaving an open end under the complainant's house, but where its agent informed the gas company that gas was not going through the pipe and entering the meter for which it was intended. In such case it was the duty of the company to turn off the gas until by examination it could ascertain that the gas was flowing properly through the pipe.

Hahn v. Southwestern Gas Co., 145 La. ——, 82 Southern 199, p. 200.

MINERS RIDING ON LOADED CARS—DUTY OWING—PROOF OF CUSTOM.

A track layer in a mine was riding out of the mine on a loaded coal car drawn by a mule. While en route a string of empty cars that had been placed on a lieway ran down grade, because the brakes were not sufficient to hold them, and collided with the car on which the track layer was riding and by reason of which he was injured. The coal mine operator in not applying the brakes to the empty cars so as to prevent them from running down grade was guilty of negligence as to the drivers of loaded cars or other persons having a right to be on the loaded cars; but he was not guilty of negligence as to the track layer unless he had a right to be on the loaded car at the time of the injury and unless the mine operator was charged with the duty of anticipating his presence on the loaded car. If it was customary for miners not connected with the operation of cars to ride on loaded cars with the knowledge of those in charge of the mine in going in and out of or about the mine, then the operator owed the track layer the duty of protecting him while so riding on a car. In the absence of proof of any such custom a court could not assume as a matter of law that the operator owed a duty to the track layer while riding on a loaded car; but it was a question of fact as to whether or not such a custom existed and to be determined by the jury under the evidence in the case.

West Kentucky Coal Co. v. Smithers, —— Ky. ——, 211 Southwestern 580, p. 581.

INSUFFICIENT PROPPING.

A mine owner may be charged with actionable negligence where the roof of the mine was so loosely propped that a chance blow, such as a mule running against a prop could knock it down, and that such a mischance might reasonably be expected to happen in the ordinary course of mining operations and in such case a jury might find that such negligence was the proximate cause of an injury to the driver of the mule and that the injury was immediately produced by the accidental contact of the mule with the prop.

Brilliant Coal Co. v. Barton, —— Ala. ——, 81 Southern 828, p. 830.

INSTRUCTION—TIMBER "TOO NEAR THE RAIL."

In an action by a miner for damages for injuries caused by being caught between a supporting timber and a mine car, the court instructed the jury that the question as to negligence would be whether or not the timber or post was in fact "too near the rail." This statement informed the jury that if the post or timber in question was "too near" the track its maintenance in that position was negligence as a matter of law. This instruction withdrew from the jury the question of the feasibility of any other mode of supporting the roof at that point, and also the question of the miner's injury being a natural and probable result to be anticipated from such location.

These questions rested upon inferences from the evidence to be drawn only by the jury.

Birmingham Fuel Co. v. Taylor, —— Ala. ——, 81 Southern 630, p. 631.

DUTY OF OPERATOR TO FURNISH SAFE PLACE.

NONDELEGABLE DUTY.

A primary and nondelegable duty rests upon a coal mine operator to exercise reasonable care in furnishing a miner with a reasonably safe place to work.

Consolidated Coal Co. v. Marcum, 257 Federal 287, p. 288.
See Dasher v. Hocking Min. Co., 212 Federal 628.

INSPECTION—SUFFICIENCY AND PRESUMPTION.

In an action for damages for injuries to a miner by the fall of a rock the evidence showed that before the accident a miner went into the raise to inspect and that he came down again after he had been on the raise 20 or 30 minutes; but there was no direct evidence of any particular kind of an inspection. Under this evidence the court can not presume or hold that there had been a proper inspection or that any particular inspection had been made, and that the mine operator had therefore performed his duty.

Wooton v. Dragon Consol. Min. Co., —— Utah ——, 181 Pacific 593, p. 594.

BREACH OF DUTY—PLEADING.

A complaint by a miner for damages for injuries is sufficient where it shows a legal duty owing by the mine operator to use care to make the working place of the miner safe for the kind of work he was doing, avers a breach of that duty by the mine operator and an injury to a miner. The complaint need not specifically allege that a duty was owing on the part of the mine operator to the miner as the existence of a duty depends upon the facts pleaded, and the law would imply its existence where the facts stated warrant such inference.

Fauvre Coal Co. v. Kushner, —— Ind. ——, 123 Northeastern 409, p. 413.
See Rock Oil Co. v. Brumbaugh, 59 Ind. App. 640, 108 Northeastern 260.

REMOTE CONTINGENCY.

A safe working place is not necessarily inferred from the fact that no employee had ever before throughout many years of operation been injured by contact with a post in a mine near a car track, and does not as a matter of law disprove negligence in failing to furnish a safe place. That which never happened before and which in its character is such as not naturally to occur to prudent men to guard against its happening at all, can not when in the course of years it does happen furnish good grounds for the charge of negligence in not foreseeing its possible happening and guarding against the remote contingency.

Birmingham Fuel Co. v. Taylor, —— Ala. ——, 81 Southern 630, p. 631.

DUTY TO PROVIDE SAFE APPLIANCES.

FAILURE TO SUPPLY—KNOWLEDGE OF DEFECTS—FAILURE TO INSPECT.

In an action by a miner for damages for an injury resulting from the breaking of a rope used to sustain and hold the weight of a dump car, proof that immediately before the accident an engine had run over the rope and that no inspection was then made to determine the sufficiency and safety of the rope before it was used to haul the dump car was sufficient to justify the jury in finding that the breaking of the rope was due to its being run over by the engine.

Duran v. Yellow Aster Min. & Mill. Co., —— Cal. App. ——, 181 Pacific 395, p. 396.

DEFECTIVE APPLIANCE—BURDEN OF PROOF.

A driver whose car had jumped the track was using a jack supplied by the mine operator to raise the car to get it back on the track. While so engaged the lever of the jack flew back, striking him in the eye and producing the injuries complained of. The burden was on the miner, to entitle him to recover, to show not only that the jack was defective but that the defect was known to the mine operator or could have been known to him by the exercise of ordinary care. The slipping of the jack that caused the lever to fly back was some evidence of its defective condition, but there was nothing to show the character of the defect or how long it had existed. Proof that the foreman knew that another miner had his fingers cut off by the jack did not show any knowledge of any defect in the jack, as that accident may have been due entirely to the negligent operation of the jack.

Howell v. Stearns Coal & Lumber Co., —— Ky. ——, 212 Southwestern 463.

EXERCISE OF CARE—EMPLOYER NOT INSURER.

It is the duty of a mine operator to exercise ordinary care to furnish a reasonably safe pipe wrench for use for his employees. But this is not, as a matter of law, an absolute duty; and it is error for a court to charge a jury to the effect that it is the duty of an employer to furnish reasonably safe machinery and tools with which his employees work and that a failure to do so is negligence on the part of the employer.

Texas & Pacific Coal Co. v. Ervin, —— Tex. Civ. App. ——, 212 Southwestern 234, p. 235.

DUTY TO WARN OR INSTRUCT.

LIABILITY FOR FAILURE TO WARN.

An experienced miner was employed as a timberman in a mine. In the performance of his duties he was required to go through the mine from time to time and ascertain where timbering might be required. The mine operator maintained a large number of ore chutes, through which ore and refuse were carried down to a lower lever. The miner knew of the existence of these chutes. Under these circumstances the law did not impose upon the mine operator the duty of warning or instructing the miner as to the particular location of the different chutes. The ore chutes did not constitute a latent defect nor were they a concealed danger in the sense that the miner should be warned, nor was the condition of the chute suddenly changed so as to endanger the safety of the plaintiff. The chutes were common and constituted a part of the method by which the operator conducted the mining operations. In passing through the mine in the performance of his duties the miner had at least as good an opportunity to learn the location and condition of the ore chutes as anyone and his knowledge in that regard was equal to the operator's.

Macky v. Bingham, New Haven Copper & Gold Min. Co., —— Utah ——, 180 Pacific 416, p. 417.

INEXPERIENCED MINER—INSUFFICIENT WARNING.

An inexperienced miner was employed to shovel ore into a chute upon an upper level of a mine. The chute was emptied by a door at the bottom by means of which the ore was loaded into cars. When the chute was filled with ore, there was some danger to the miner shoveling the ore if the door was opened and the ore began to run out and settle down at the top; but it was particularly dangerous to the ore shoveler when from any cause the ore became congested, as it frequently did, and stuck in some part of the chute above the door and from any cause suddenly became released and would thereby draw the ore down from above. The miner at the time he was set to work was warned of the general danger of the ore settling when the door below was open for the ore to run out; but he was given no warning of the greater danger in case the ore became congested and was suddenly loosed and fell below into the empty part of the chute. While the miner was working shoveling ore into or over the chute, the ore became congested at some point in the chute and afterwards suddenly gave way and the rapidly sinking ore drew the miner into the chute causing his death. The warning given as to the particular danger that did in fact cause the miner's death was entirely insufficient considering the experience of the miner and the particular danger the mine operator knew that the miner might encounter.

Ozark Min. Co. v. Silva, 255 Federal 821, p. 823.

HAZARDOUS UNDERTAKING—EMPLOYER'S KNOWLEDGE OF DANGER.

It is the duty of a mine operator to notify a miner of dangers that are latent and known to the mine operator but unknown and unappreciated by the miner and are not readily observable by him, so that one of his age, experience, and intelligence would know and appreciate the danger and would know how to avoid the dangers.

Ozark Min. Co. v. Silva, 255 Federal 821, p. 824.

DUTY TO PROMULGATE RULES.

CONSTRUCTION AND APPLICATION OF RULE.

A coal mine operator had a rule that no employees should ride on a motor or trip of loaded cars except those operating the motor or trip and made it the duty of the motormen not to allow any one to ride on the motor or cars except by permission of the foreman. The construction of such a rule is for the court and it should be construed so as to carry out the purpose of its adoption but its scope should not be extended to include cases not embraced in the language employed. The company evidently regarded the riding on the motor or on cars drawn by the motor as especially dangerous and the rule was adopted to meet that condition. The rule especially emphasizes the words "motor," "trip," "locomotive," "trip of loaded cars," "motor trip" and "motorman." The rule therefore applies only to motors or cars drawn by motors and does not apply to a single car drawn by a mule and a miner riding on a car drawn by a mule at the time of his injury was not violating the rule in question.

West Kentucky Coal Co. v. Smithers, —— Ky. ——, 211 Southwestern 580, p. 581.

RULES ABROGATED OR WAIVED.

A coal mine operator had a rule requiring machine runners and helpers to carefully sound the roof of their working place before beginning work and if weaknesses were discovered extra props must be set. A machine operator did not know of this rule, but he did examine a room in substantial compliance with the rule before beginning work but found no evidence of weakness. The mine operator had not in fact enforced or relied but rather had waived the rule by keeping employed a force of men to perform the particular work required by the rule.

Consolidated Coal Co. v. Marcum, 257 Federal 287, p. 289.
See Eagle Coal Co. v. Patrick, 161 Ky. 333, 170 Southwestern 960.

CUSTOMARY VIOLATION—EFFECT.

Custom and usage may be relied upon to excuse the violation of a rule where the act involved is not negligent itself but only by relation to the rule violated. When the act may be done in two or more ways and resort to neither of which involves obvious peril which raises the legal presumption or conclusion of negligence in the doing of it, a custom or usage to do it in a particular way may be looked to as tending to show that it was not negligence to resort to that method in the particular instance. But custom can in no case impart the qualities of due care and prudence to an act which involves obvious peril which is voluntarily and unnecessarily done and which the law itself declares to be negligent.
Brilliant Coal Co. v. Barton, —— Ala. ——, 81 Southern 828, p. 830.

DUTY TO FURNISH FIRST AID.

DUTY AND CARE REQUIRED.

It is the duty of a mine operator or other employer where an employee is injured to exercise ordinary care to secure and provide first aid for the injured employee and in the exercise of such care to secure for the injured employee surgical and medical treatment at the hands of competent physicians and surgeons.
Hunicke v. Meramec Quarry Co., —— Mo. ——, 212 Southwestern 345.

MINER'S WORKING PLACE—SAFE PLACE.

MAIN ENTRY—RELATIVE DUTY OF MINER AND OPERATOR—QUESTION OF FACT.

Under the law of Missouri it is the duty of a miner to keep his working place safe, and it is the duty of the mine operator to keep the entries, the places generally used by many miners, in a condition of reasonable safety. A miner was injured in a main entry in which at the time he was preparing a room neck. The proof showed that the mine operator had what was called "day men" whose duty it was to go through the entries and see that they were safe and the operator's servants had known for some time before the accident causing the injury complained of that the rock that fell was loose. The proof also showed that it was the company's duty to take care of the loose rock according to the custom of the mine and that the miner who was injured had no right to take the rock down. Under this proof it was a question of fact for the jury to determine whether it was the duty of the miner or the duty of the mine operator to keep the particular place safe.

Teter v. Central Coal & Coke Co., —— Mo. App. ——, 213 Southwestern 135, p. 136.

See State v. Ellison, 270 Mo. 645, 195 Southwestern 722.

INSTRUCTION AS TO DUTY OF MINER.

In an action by a miner for damages for injuries caused by a fall of rock from the roof of an entry and under which the miner was at the time engaged in starting a room neck the court could not as a matter of law instruct the jury that the miner was required to use ordinary care in inspecting the roof above him "if he had to use a small portion or section of the main entry," where the evidence was conflicting as to whether it was the duty of the miner or of the mine operator to inspect and keep safe the roof of the entry.

Teter v. Central Coal & Coke Co., —— Mo. App. ——, 213 Southwestern 135, p. 137.

OPERATOR'S ASSURANCE OF SAFETY—RELIANCE.

MINER'S KNOWLEDGE OF DANGER—RELIANCE UPON ORDERS OF EMPLOYER.

A room in a mine was left standing and unused for about a year and the roof was during the time supported by numerous posts. This exposure naturally weakened the roof. The mine operator kept employees whose duty it was to put rooms of this kind in proper condition for the cutting of coal, and these employees did prepare this particular room for coal cutting and thereupon a miner and his assistant who were operating a coal cutting machine were directed to remove the machine to this particular room and to proceed with the cutting of coal. The operator of the machine was not satisfied that the room had been put in fit condition and upon complaint additional work was done in the room and thereupon the foreman told the machine operator that the room was "in condition to cut," "in good shape," and peremptorily ordered him to do the work or leave the employ of the company. The machine operator on further examination and some sounding of the roof, though not a careful examination was made, but relying on the assurance of the foreman, yielded to the peremptory order, took the machine into the room and began to cut coal, and within 30 minutes was injured by a fall from the roof. Under these circumstances the question of negligence on the part of the mine operator and of contributory negligence on the part of the machine operator were questions of fact to be determined by the jury.

Consolidated Coal Co. v. Marcum, 257 Federal 287, p. 288.

VICE PRINCIPALS.

VICE PRINCIPAL—NEGLIGENCE—LIABILITY OF MASTER.

A miner was directed by the shift boss to go on top of certain lagging above an ore chute and nail it down before the machine men blasted their holes. The machine men informed the miner that they were going to blast and directed him to come up; thereupon he asked them if everything was all right and was told by one of them that everything was all right and that he could proceed in safety. As the miner was going up on top of the chute he was hit on the head by a rock. It was the duty of the machine men to inform the miner of any apparent danger and not to induce him to believe that everything was safe. It was their duty to exercise ordinary care to prevent injury to the miner and if they failed in the discharge of that duty they were guilty of negligence, and as they represented the operator their knowledge was his and their negligence was his. It was therefore under the circumstances a question of fact whether there was negligence and whether it was the proximate cause of the injury to the miner or not.

Arrascada v. Silver King Coalition Mines Co., —— Utah ——, 181 Pacific 159, p. 160.

SUPERINTENDENCE OF EMPLOYEE.

A mine operator is liable for injuries to a miner caused by the negligence of another employee who had superintendence intrusted to him where the injuries complained of were caused by an unexpected charge left by miners under the direction of the employee to whom superintendence had been intrusted.

Alabama Fuel & Iron Co. v. Smith, —— Ala. ——, 82 Southern 30, p. 31.

KNOWLEDGE OF SUPERINTENDENT IMPUTED TO OPERATOR.

The actual knowledge of the superintendent of a mine that a certain part of the mine was gaseous is imputed to the operator and renders him liable for the death of a miner caused by an explosion of gas produced by running an electric motor through such gaseous portion of the mine.

Jaras v. Wright, —— Pa. ——, 106 Atlantic 798, p. 800.

FELLOW SERVANTS—RELATION—NEGLIGENCE.

WHO ARE—MINERS PERFORMING DIFFEPENT DUTIES.

An employee in a mine was employed and engaged in doing timbering or carpenter work and his working place at the time of his injury was in an ore chute below the bulk head. At the same time the working place of machine men engaged in drilling was in the raise above the bulk head. The bulk head or lagging on the top of the chute could be considered as a wall separating the place of work of the timberman and that of the machine men. Under these facts the timberman was not a fellow servant of the machine men; but on testimony denying the particular situation at the time of the injury, the question of the relation of the timberman and the machine men was one of fact.

Arrascada v. Silver King Coalition Mines Co., —— Utah ——, 181 Pacific 159, p. 161

COMBINED NEGLIGENCE OF OPERATOR AND FELLOW SERVANT—QUESTIONS OF FACT.

A miner was by the sudden starting of a car thrown against a prop or post placed near the car track and received injuries for which he sued. The negligence of the car driver in starting the car suddenly could not be regarded as the proximate cause of the injury if the mine owner was negligent in placing and maintaining the prop or post too near the track, but these were questions of fact to be determined by the jury on the trial of the case.

Birmingham Fuel Co. v. Taylor, —— Ala. ——, 81 Southern 630, p. 631.

DEVIATION FROM DUTY—LIABILITY OF EMPLOYER.

A mining corporation or an oil company is liable for injuries inflicted by the negligence of an employee where a deviation from the instructions of the employer or from the line of duty of the employee is a mere incident to the discharge of the duty which the employee is performing at the time such departure occurs, and after the termination of which the authorized service is resumed.

Pierce-Fordyce Oil Association v. Brading, —— Tex. Civ. App. ——, 212 Southwestern 707, p. 709.

CONTRIBUTORY NEGLIGENCE OF MINER.

QUESTION OF FACT.

Where reasonable men might honestly differ in their conclusion and where the facts pleaded are of a character to be reasonably subject to more than one inference as to whether contributory negligence on the part of the plaintiff existed, then the question is one for a jury to determine.

Fauvre Coal Co. v. Kushner, —— Ind. ——, 123 Northeastern 409, p. 413.

INJURY BY EXPLOSION—QUESTION OF FACT.

An oil-well driller while engaged in the drilling of an oil and gas well was injured by being struck by a piece of an acid tank used for storing explosives and which exploded by reason of the negligence of the employer. Before the explosion the plaintiff had observed a fire nearby and near to a building where nitroglycerin and other explosives were stored. Thereupon he with others went a distance of one-half to three-quarters of a mile, and while at such distance heard three explosions, the last of which was a big one, and believing that the explosives had all exploded he with the other persons returned to the vicinity of the burning building and was on his way to his work when struck and injured. Under these facts the question of the contributory negligence of the plaintiff was one of fact to be determined by a jury in the trial of a suit for damages.

American Glycerin Co. v. Hill, 255 Federal 841.

QUESTION OF LAW.

Where the question of a plaintiff's contributory negligence is involved it is only when the evidence is of such a nature that all reasonable men upon the facts shown would say that the plaintiff was guilty of negligence that it becomes a question of law and is sufficient to justify a court to direct a verdict against the complainant.

American Glycerin Co. v. Hill, 255 Federal 841, p. 842.

BURDEN OF PROOF.

In an action by an oil-well driller for personal injuries caused by an explosion, the burden of proof to establish the contributory negligence of the complainant was on the defendant, and such contributory negligence must be established by a preponderance of the evidence.

American Glycerin Co. v. Hill, 255 Federal 841, p. 843.

SUDDEN PERIL—DUE CARE.

The fact that a miner saw another way of acting when suddenly called upon to extricate himself from a dangerous position, though it might have conserved his safety, does not of itself render him guilty of contributory negligence in resorting to the mode of escape he actually adopted. To have this result the danger of the one and the safety of the other must be obvious to a reasonable and prudent observer. But in the sudden emergency the question of due care becomes one for the jury.

Birmingham Fuel Co. v. Taylor, —— Ala. ——, 81 Southern 630, p. 632.

DISOBEYING RULE.

Where the duties of an employee in given circumstances are peculiarly specific any unambiguous and reasonable rule of the employer of which the employee has knowledge and to which he has consented by entering and continuing in the service binding, and his nonobservance or disobedience of any such rule at the time when it is capable of observance, is a matter of law, and is not to be judged by the undefined and varying requirements of ordinary care.

West Kentucky Coal Co. v. Smithers, —— Ky. ——, 211 Southwestern 580, p. 581.

DRIVING MULE WITHOUT REINS.

Driving a mule without reins in a mine can not be said to be obviously dangerous; and a mule driver can not be said to have voluntarily and unnecessarily practiced driving without reins where the animal was delivered to the driver by the mine operator without the equipment of reins as this was in effect a command to drive without the reins.

Brilliant Coal Co. v. Bartin, —— Ala. ——, 81 Southern 828, p. 830.

PLEADING—INSUFFICIENT ALLEGATION—DEFENSE.

The driver of a mule in a coal mine was injured by a fall of rock from the roof. The fall was occasioned by the mule striking and knocking down a prop leaving the roof unsupported. A plea by the defendant alleged that the driver "holloed" at the mule he was driving loose in the mine thereby causing the mule to turn near the prop and knock it down does not show that the driver gave the wrong direction to the mule following which the catastrophe happened and therefore there is nothing to support an inference of negligence on the part of the injured driver. The fact that the driver "holloed" at the mule "does not import an address so rude as might be expected to shock the sensibilities of a mule, and so to drive him to disorder and dangerous action." The fact that the driver knew the mule was "vicious" does not tend to show that his attempt to command the mule by speech was unadvised or improper or in any way negligent. It may be assumed that the driver's "hollo" was a command to the mule to do the right thing in terms supposed to be intelligible to his mulish intelligence. The mule's disobedience can not be translated into contributory negligence on the part of the driver.

Brilliant Coal Co. v. Barton, —— Ala. ——, 81 Southern 828.

EXPLOSION OF GAS.

In an action by the owner of a residence for damages for loss of property by fire caused by a natural gas explosion, the owner is not to be charged with contributory negligence because he insisted upon having the drip pipe placed in the basement rather than out of doors, where there was evidence that there was no inherent danger of an explosion of gas due to the placing of the drip pipe in the basement and where it also appeared that the entire gas supply to the house could be cut off by closing a stopcock in the service pipe thereby obviating all possible danger of fire during the cleaning of the drip pipe.

Willard v. Valley Gas & Fuel Co., —— Cal. ——, 182 Pacific 32, p. 33.

ASSUMPTION OF RISK.

RISK ASSUMED.

ORDINARY RISKS AND KNOWN EXTRAORDINARY RISKS.

A miner by entering and continuing in the employment of mining operations without complaint assumes the ordinary risks and dangers of the employment as well as the extraordinary risks and dangers which he knows and appreciates and the risks and dangers of defects in the place, structure, or work, which are so patent as to be readily observable by the use of his senses, his age, intelligence, and experience considered.

Ozark Min. Co. v. Silva, 255 Federal 821, p. 824.

RULE OF COMMON LAW—COMPENSATION—RATE OF WAGES.

The answer that the common law makes to the hardship of requiring the employee to assume all consequences, both personally and pecuniarily of injuries arising out of the ordinary dangers of the occupation is that the parties enter into the contract of employment with these risks in view and that the consequences ought to be and presumably are taken into consideration in fixing the rate of wages.

Arizona Copper Co. v. Hammer, 39 Supreme Ct. Rep. 553, p. 556.

CONTRACT TO DRILL OIL WELL—OPTION TO USE OLD HOLE.

A driller contracted to drill an oil well to a depth of 2,000 feet and to deliver to the landowner a good clean hole. The contract gave the driller the option of using an old abandoned well or hole that had been drilled two-thirds of the distance and abandoned because of the inability of the original driller to finish it in a workmanlike manner. If the drill could complete the well without trouble the contract would be an exceedingly profitable one to him and to get the benefit of this chance the contractor assumed risks that went against him in his effort to complete the well and make a good clean hole. The well did reach the depth of 2,000 feet and thereby gave the landowner the benefit of the test of the territory, but the driller under the terms of the contract was entitled to no compensation if he failed to furnish a good clean hole, the only thing for which the landowner agreed to pay.

Bain v. White, 256 Federal 428, p. 434.

RISKS NOT ASSUMED.

DEFENSE—FAILURE TO PLEAD.

In an action by a miner for damages for injuries where the defense of assumed risk was not pleaded, the court, by its instructions, should not submit that issue to the jury.

Texas & Pacific Coal Co. v. Ervin, —— Tex. Civ. App. ——, 212 Southwestern 234, p. 235.

LATENT AND UNKNOWN DANGERS.

A miner employed in a mine does not assume risks and dangers that are latent, that though known to the employer, are unknown and unappreciated by him, and are not readily observable by a person of his age, intelligence, and experience.

Ozark Min. Co. v. Silva, 255 Federal 821, p. 824.

INJURY TO MUCKER—OPERATOR'S FAILURE TO INSPECT.

A mucker in a mine was injured by a fall of rock from the side of roof of a hole in which he was working. His only protection from injury lay in the care and precaution exercised by the mine operator in having the walls and roof of the hole properly inspected. Under such circumstances the mucker did not assume the risk of injury.

Wooton v. Dragon Consol. Min. Co., ——Utah ——, 181 Pacific 593, p. 595.
See Miller v. Utah Con. Min. Co., —— Utah ——, 178 Pacific 771.

PROXIMATE CAUSE OF INJURY.

OBEYING ORDERS OF SUPERIOR.

An electric helper in a mine while riding on a car on a railway in the mine propelled by an electric motor, and while in his employment as an electrician's helper, was ordered by his superior to throw off his tools and to get off at a certain place. At the point designated the electrician threw off his box of tools and himself safely alighted from the car and was walking along by the side of it. While so walking the superior, who had given the order himself, attempted to alight from the car, but his clothing was caught by a projecting bolt and by reason of which he was carried along until his body came in contact with the electrician, knocking him down and under the car, in consequence of which he received the injuries complained of. The negligence charged was that the superior negligently ordered the electrician to alight from the car and that the complainant conforming to said order received the injuries. The order of the superior directing the electrician to alight was evidently not the proximate cause of the injury as in obedience to that order the electrician safely alighted from the car and thereupon an unforeseen and an entirely different agency operated to produce the injury.

Woodward Iron Co. v. Gamble, —— Ala. ——, 81 Southern 810.

MINE INSUFFICIENTLY LIGHTED—COMPETENCY OF WITNESS.

In an action by a motorman for damages for an injury caused by a switch being improperly turned the alleged negligence of the mine operator in failing to properly and sufficiently light the mine can not warrant a recovery where, under the evidence the improper lighting in no way contributed to the accident that caused the injury.

Texas & Pacific Coal Co. v. Sherbley, —— Tex. Civ. App. ——, 212 Southwestern 758, p. 760.

CONTRACTS RELATING TO OPERATIONS.

CONTRACT OF SALE—BREACH AND FORFEITURE—CONSTRUCTION.

A contract for the sale of a mine provided that on default of the purchaser the contract should become void, and all payments should be forfeited and to be deemed as liquidated damages, and upon default the party of the second part "shall immediately deliver up possession of said mining claims to said first parties together with all improvements placed thereon by said second party." This contract can not mean that it is only the installment payments that are deemed liquidated damages in case of a forfeiture of the contract, and the clause relating to the improvements must be considered as a penalty to be awarded to the owners only in so far as he may show that he has suffered actual damages from the breach of the contract. The purchaser had the right to extract ores from the mine and apply the proceeds to his own use, and the clause is not unreasonable, viewed as a consideration for this privilege, and the forfeiture clause necessarily extends to the improvements.

Siegloch v. Bisbee, —— Wash. ——, 181 Pacific 51, p. 54.

CONTRACT OF SALE—BREACH AND FORFEITURE—IMPROVEMENTS.

A contract for the sale of certain mines and mining claims stipulated that time was the essence of the contract and that on failure of the purchaser to pay the installments of purchase money the contract should become void and all payments and improvements placed in the mine should be forfeited and become the property of the seller. On breach of the contract the seller could claim a forfeiture of all the property which was more or less attached to the freehold and was of a permanent nature and added to the value of the property for the uses for which it was intended and to aid in the extraction of ore profitably and successfully. But the term could not include sundry loose mining tools, equipment, and supplies useful in the operation of the mine and its subsidiary activities, but in no sense improvements on the realty.

Siegloch v. Bisbee, —— Wash. ——, 181 Pacific 51, p. 53.
See Smith v. Detroit, etc., Gold Min. Co., 17 S. Dak. 413, 97 Northwestern 17.

OPTION CONTRACT TO PURCHASE—CONSTRUCTION.

A lease of a mine gave the lessee an option to purchase the mining property upon the performance of the conditions and the payment of certain stipulated sums and provided that in the event the lessee shall fail or neglect to keep or perform his part of the contract, "this option shall be forfeited and all previous payments made shall be forfeited as well as all machinery, tools and appliances placed thereon by the party of the second part." Such a contract is not a contract of purchase and sale governed by the legal principle applicable to vendor and vendee but is simply a lease with an option to purchase.

Virginia Min. Co. v. Haeder, 32 Idaho ——, 181 Pacific 141.
Hammitt v. Virginia Min. Co., —— Idaho ——, 181 Pacific 336, p. 337.

PAROL AGREEMENT FOR LEASE—SPECIFIC PERFORMANCE.

The lessee of a coal mine under a parol agreement that has been clearly proved took possession of the mining property and made valuable, permanent improvements thereon under the assurance by the authorized agents and officers of the mining corporation as owner that a formal lease in accordance with the parol agreement would be executed, is entitled to have such parol agreement specifically enforced.

Oberman v. Red Rock Fuel Co., —— W. Va., ——, 99 Southeastern 66, p. 74.

AGREEMENT TO DRIVE HEADINGS—STATUTE OF FRAUDS.

A miner agreed with a coal mining company that he would furnish the labor, tools, and explosives and drive four rock headings in the coal mine of the corporation six feet in height and twelve feet in width, limited by the coal holdings of the company estimated to be 4,000 feet. The miner was to be paid at the rate of $14 per lineal yard, payments to be made on the regular semimonthly pay days for the work done. The miner immediately proceeded with his preparations to perform the contract and secured the necessary tools, supplies and equipment and employed laborers and workmen to carry out the contract, but the mining company repudiated the contract and refused to permit him to enter upon and continue the work. The contract did not by its terms or by necessary implication extend the performance of the work beyond a year and was not therefore void under the statute of frauds. A contract is not within the statute of frauds merely because it was not expected to be performed within a year if it is one that under all the circumstances admits of performance within a year.

Rua v. Bowyer Smokeless Coal Co., —— W. Va., ——, 99 Southeastern 213, p. 216.

PAROL CONTRACT FOR MINING—CERTAINTY AND RATIFCATION.

Where a parol contract for certain mining operations was subsequently ratified or covered by letters and telegrams between the parties, which described the subject matter of the contract in general terms, a court, in a controversy arising over the contract, may go outside of the writings for the purpose of identification of the subject matter and if in doing so it can be definitely ascertained, the contract is not void for uncertainty.

Rua v. Bowyer Smokeless Coal Co., —— W. Va. ——, 99 Southeastern 213, p. 216.

INJURY TO MINING PROPERTY—JOINT TENANTS—JOINT ACTIONS.

Tenants in common of a mine must join in actions ex delicto for an injury to their common property, for the reason that the damages belong to them jointly. A cause of action for nonpayment of rent, breach of covenant for good mining and removal of property by lessee, is in the tenants in common jointly and their remedy is joint, as their interests are inseparable.

Himes v. Schmehl, 257 Federal 69, p. 71.

INDEPENDENT CONTRACTOR.

WHAT CONSTITUTES.

An independent contractor as applied to mining operations is one who exercises independent control over the mode and method by which he produces the results demanded by the contract. A contract that confers upon the mine owner much power in the way of directing the details of the mode and manner in which the work shall be done and deprives the contractee of any voice in the matter does not create the relation. A person is not an independent contractor unless he is vested by the contract with the right to control the mode and manner of doing the work.

Wooton v. Dragon Consol. Min. Co., —— Utah ——, 191 Pacific 593, p. 597.

LESSEE OF MINE—CONTROL BY OWNER.

A mine owner entered into a contract by which the contractee agreed to mine ore from the mine under the "direction and supervision" of the owner, at such place, at such times, and in such quantites as the owner should direct and place the ore mined in the owner's bin. The contractee or lessee was to furnish his own powder, fuses, caps, supplies, and labor and the owner was to furnish tools and air. The work was to be done in the customary and skillful and proper mining operation and according to the approval of the owner. This contract did not create the relation of an independent contractor, as the control reserved to the owner covered all details of the work, including direction and supervision as to times, places, and quantities, and approval of employees employed. By the contract the contractees were to hold the owner harmless from all suits, claims, and demands. The contractees were not independent contractors within the meaning of that term and the owner was not relieved from liability for injuries to a mucker, caused by a fall of rock due to a failure to properly inspect the place where the mucker worked.

Wooton v. Dragon Consol. Min. Co., —— Utah ——, 191 Pacific 593, p. 596.

LEASE OF MINE—SUBTERFUGE TO AVOID LIABILITY.

The lessor of a mine leasing the same to a lessee, or employing an independent contractor, is not liable for an injury to a miner employed by the lessee, or by the independent contractor. But as between the injured miner and the owner, or the lessor and lessee, or independent contractor, it is always a question as to the bona fides of the lease or contract, and where the proof shows that the owner or lessor was using the lessee or the independent contractor as a subterfuge to cover his own operations, it is then a question of fact whether the owner or lessor was the party in contractual relation with the injured miner.

Coal City Min. Corp. v. Davis, —— Ala. App. ——, 81 Southern 358, p. 359.

LIABILITY OF OWNER FOR INJURY TO EMPLOYEE OF CONTRACTOR.

An owner or lessor of a mine employing an independent contractor to operate the mine is not liable for an injury to an employee of the independent contractor who was under the direction and control of the independent contractor at the time of the injury, unless the owner or lessor was under some duty to the employee.

Coal City Min. Corp. v. Davis, —— Ala. App. ——, 81 Southern 358, p. 359.

EMPLOYEE HIRING MINER—BANK BOSS IN CONTROL.

An employee in a mine who hired and discharged miners and who had miners working under him was not an independent contractor where the entire mine was under the supervision of the bank boss and the person to whom superintendence was entrusted was compelled to obey his orders.

Alabama Fuel & Iron Co. v. Smith, —— Ala. ——, 82 Southern 30, p. 31.

METHODS OF OPERATING.

COAL MINED OUT—ABANDONMENT OF OPERATIONS.

The mining of coal to practical exhaustion and the actual removal of all equipment and means for carrying on further operations constitutes a deliberate and undoubted abandonment of the premises.

McClure v. Monongahela Southern Land Co., —— Pa. ——, 107 Atlantic 386, p. 388.

INSPECTION BY STATE MINE INSPECTOR—PROOF INADMISSIBLE.

A mine car driver while attempting to uncouple cars in a mine was injured by being caught between a car and a post set so near the track that he could not pass between the car and the post. The post had been maintained in that position for many years. The fact that the State mine inspector had inspected the mine and raised no objection to the construction complained of as negligent was not admissible in an action by the miner for damages, in the absence of a statute authorizing him to prescribe or approve the construction and proof that he had done so.

Birmingham Fuel Co. v. Taylor, —— Ala. ——, 81 Southern 630, p. 632.

INSUFFICIENT LIGHT—COMPETENCY OF WITNESS.

On the issue as to whether a mine owner was negligent in having his mine improperly lighted at the time of an accident it is not proper to permit a witness to testify that the mine was poorly lighted at the point of the accident unless the witness qualified as an expert. It was for the witness to state facts upon which the jury might base a verdict that the mine was so improperly lighted as to constitute actionable negligence.

Texas & Pacific Coal Co. v. Sherbley, —— Tex. Civ. App. ——, 212 Southwestern 758, p. 760.

RIGHT TO SURFACE SUPPORT.

INJUNCTION TO PREVENT REMOVAL.

Equity has jurisdiction to restrain a mining company from beginning de novo to mine in and under property that the predecessor in title disclaimed and which that company itself protested had been exhausted and abandoned. Under such circumstances the plaintiff is not required to establish first a paramount title in an action at law.

McClure v. Monongahela Southern Land Co., —— Pa. ——, 107 Atlantic 386, p. 387.

NUISANCE.

OIL FROM PIPE LINE.

A pipe line leaking oil upon and over the lands across which the line is laid constitutes an abatable nuisance.

Indiana Pipe Line Co. v. Christensen, —— Ind. ——, 123 Northeastern 789, p. 790.

PERMANENT AND TEMPORARY INJURY—DAMAGES.

A landowner sued a pipe-line company for damages for injuries to his land caused by oil that escaped from the pipe line being carried over and settled upon and in the soil. The evidence showed an injury to the products of the soil and that the landowner's stock pasturing on the land was injured and some killed as a result of oil swallowed in eating grass and drinking water on the land. The landowner was entitled to recover damages for these items of loss, but under the evidence he was not entitled to an award of damages on account of permanent injury to the productive qualities of the soil. There was no evidence to show that the fertility of the soil was destroyed and that the land would remain in the same condition for an indefinite period.

Indiana Pipe Line Co. v. Christensen, —— Ind. ——, 123 Northeastern 789, p. 794.

STORING EXPLOSIVES IN THICKLY SETTLED PLACES.

An oil company maintaining a warehouse and storage tanks in a thickly settled portion of the city which contained oil, gasoline, kerosene, and other high explosives maintained both a public and a private nuisance.

McGuffey v. Pierce-Fordyce Oil Association, —— Tex. Civ. App. ——, 211 Southwestern 335, p. 337.

INJUNCTION.

OIL AND GAS—EXPLORATIONS IN BEDS OF STREAMS.

The statute of Louisiana (Act No. 30, 1915), authorizes the Governor of the State to lease the beds of certain streams and lakes to private individuals for the purpose of boring for oil and gas. Act No. 29 (Extra Session, 1915), provides that lessees of the State should not be enjoined in their operations for oil and gas in river bottoms and lake bottoms the ownership of which was in the State, but the person claiming to own the land should be confined to a demand that the oil and gas produced should be judicially sequestrated and the title determined. The legislature by the latter act provided a means for the protection of all concerned by permitting drilling operations to be carried on by lessees of the State, leaving to the courts to decide who should ultimately be the owners of the product. Under these acts a lessee of the State is entitled to an injunction to prevent a landowner from interfering through force and violence with the lessee in his operations for oil and gas in the beds of certain named streams.

Wemple v. Eastham, 144 La. ——, 81 Southern 438, p. 439.

MINING LEASES.

LEASES GENERALLY—CONSTRUCTION.

NATURE—CONSTRUCTION.

A State mining lease under the statute of Minnesota is not a conveyance of ore in place but it is in fact as it is in form a lease.

State v. Cavour Min. Co., —— Minn. ——, 173 Northwestern 415.

STATE LEASE—CONSTRUCTION—ROYALTIES—RIGHTS OF LESSEE.

A State mining lease provided that there should be a minimum output of 5,000 tons annually and if that number of tons was not mined the lessee should pay the State a royalty of 25 cents per ton on 5,000 tons. The minimum royalty was the agreed compensation for the use and occupancy for a year of the leased premises for the purposes and uses and in the manner and with the rights fixed by the lease. The lessee by the lease obtained the right to take within the year 5,000 tons of ore on which he must pay the stipulated royalty and he was likewise bound to pay the royalty on that amount of ore even if no ore was mined. If he failed to mine any ore in a given year or mined less than the stated 5,000 tons he was not entitled to have his annual payment of $1,250 for such year applied wholly or in part on royalties accruing in subsequent years on ore mined in such years in excess of the 5,000 tons, in the absence of an agreement in the lease to that effect.

State v. Cavour Min. Co., —— Minn. ——, 173 Northwestern 415.

STATE LEASE—CONSTRUCTION—ROYALTY ON UNWASHED ORE.

A State executed a lease of lands for the purpose of exploring for, mining, taking out and removing therefrom the merchantable and shipping iron ore. The lessee agreed to pay the State at the rate of 25 cents a ton for all the ore mined and removed. In the operation of the mine a body of lower grade ore was mined which could not be used in the furnaces under present furnace methods, but it could be mined and washed in a washing plant constructed upon the leased premises and the concentrates shipped to the furnace and sold at a profit after paying the mining, washing, and transportation charges and the royalty. But no profit would result if the ore was shipped to the furnaces and washed there, as the cost of transportation prevented such operations. Under the lease the mined ore before washing was the ore referred to and upon which the lessee under the terms of the lease must pay the royalty of 25 cents per ton and not upon the lesser tonnage of concentrates.

State v. Hobart Iron Co., —— Minn. ——, 172 Northwestern 899.

CONSTRUCTION—RIGHT TO EXTEND TERM.

A mining lease was for a period of five years and gave the lessee the right to mine and remove fluorspar during the period. The lease provided: "So long as second party may hold in its possession this title paper, or fail to give notice to the first parties of its intention to surrender said lease, then second party will be liable for and shall pay each year the minimum guaranteed royalty of $50 whether the said mines are worked or not and should second party fail to pay the royalty as stipulated herewith, or fail in any material way to live up to this contract then first party shall have the right to declare a forfeiture and terminate." This means that the lessee had the right to surrender the lease and avoid liability for the royalty by surrendering the title paper at any time within the five years, but if not then he should be responsible for the royalties whether the mines were operated or not. This provision did not extend the period beyond the five years but gave the lessee the privilege of terminating it within five years, and by its own terms the lease terminated five years from its date and thereafter the lessee had no further rights upon the premises.

Kentucky Fluorspar Co. v. Pierce, —— Ky. ——, 213 Southwestern 542, p. 545.

VALIDITY OF LEASE—GOOD FAITH OF LESSOR—BURDEN OF PROOF.

The Rising Sun Mining Company, the owner of a large tract of zinc land, in order to promote its sale, leased one of its mines together with the mill situated thereon, to certain persons and gave the lessee an option to purchase. The lessee operated the same as a firm or company and subsequently all withdrew but one who continued to operate the mine and became largely indebted and insolvent. Thereafter the Rising Sun Mining Company sued the retiring members to recover an alleged indebtedness due from the firm to the company. The action was defended on the ground that the lease was a simulated one and that there was a secret understanding that the lease should never become binding and that the mine was in fact operated for the Rising Sun Mining Company and was intended to aid the company in making a sale of its mineral lands. The burden of proof was upon the defendants to maintain this affirmative defense, and failing to establish the facts by the burden of proof, the plaintiff was entitled to a judgment.

Doane v. Rising Sun Min. Co., —— Ark. ——, 213 Southwestern 399, p. 400.

AGREEMENT TO EXECUTE—STATUTE OF FRAUDS—MEMORANDUM.

An agreement was entered into between a landowner and the president of an oil company by which the landowner upon the payment of a bonus of $10,000 was to execute a lease of his land for oil purposes. The contract was not in writing but the president of the company delivered to the landowner at different times and in different amounts checks of the company. These were indorsed to the effect that the amount was an "installment of bonus on lease" on certain described lands; and on one was the statement "in full settlement of within account." This indorsement was signed by the landowner. The memoranda indorsed on the checks do not indicate to whom the lease was to be executed and they were not signed by the party to be charged. His signature on the back of the checks was an acknowledgment of the receipt of the payments "in settlement of the account," referring to the installments on the bonus agreement. The memoranda were not sufficient to take the agreement out of the statute of frauds and did not evidence an enforceable contract to execute a lease to the oil company.

Hibernian Petroleum Co. v. Davies, —— Cal. App. ——, 181 Pacific 836, p. 837.

LESSOR'S ELECTION NOT TO FORFEIT—LESSEE'S LIABILITY FOR RENT FOR FULL TERM.

The owners of an unpatented mining claim leased a portion of the surface for business purposes for a term of five years. The lessee was permitted to erect thereon suitable buildings for the purpose of doing a hay and grain business and was given the right to remove the buildings within 20 days after the expiration of the lease if the lessor did not exercise the option given him to purchase the buildings. If any of the payments should be due and unpaid the lessor was given the right to reenter and terminate the lease, or the lessor might waive such default and continue the lease in force and thereupon rental for the full term should become due and payable. On the failure of the lessee to pay the installments of rent as provided, the lessor brought suit to recover the entire rent for the full term, thereby electing to depend upon the recovery of the rent rather than the forfeiture of the lease. The lessee in an action for the rent by the lessor could not defend on the ground that the lessor had not in fact completed a valid mining location.

Lynch v. Clark, —— Ariz. ——, 179 Pacific 960, p. 961.

JOINT LEASE—JOINT COVENANT—ACTION BY ONE COOWNER.

Two joint owners of a graphite mine leased the same for operation. The rent was made payable to the lessors jointly and all the covenants of the lease run to the lessors jointly. Under such a lease one coowner can not maintain an action for an accounting or for damages for a breach of the covenants or for rent due for his particular share according to his separate interest.

Himes v. Schmehl, 257 Federal 69, p. 70.

OPTION CONTRACT TO PURCHASE—EXTENSION OF TIME—CONSTRUCTION.

A mining lease contained an option by which the lessee should have the right to purchase the mining property on performance of the conditions stated. The lease and the option agreement expressly provided that "time is of the essence of this agreement." The time for making the stipulated payments was subsequently extended by a written agreement between the parties. But the written agreement, based upon a valuable consideration, extending the time in which payments upon the original contract must be made to a definite date, did not operate as a waiver of the provision in the contract making time of the essence thereof.

Virginia Min. Co. v. Haeder, 32 Idaho ——, 181 Pacific 141, p. 142.
Hammitt v. Virginia Min. Co., —— Idaho ——, 181 Pacific 336, p. 337.

OPTION CONTRACT—FORFEITURE.

A mining lease for a definite period contained an option for the purchase of the mining property, but it did not contain any express provision for forfeiture. Under such a lease it is doubted whether a forfeiture could be enforced.

Grant Chrome Co. v. Marks, —— Ore. ——, 181 Pacific 345, p. 346.

OPTION CONTRACT—CASH BONUS—MUTUALITY.

A mining lease provided for the mining of minerals on a royalty basis and gave the lessee an option to purchase upon the payment of a stipulated sum in cash. The contract stated that the consideration was $1 paid by the lessee to the lessor and the mutual benefits that would flow to both parties by the fulfillment of the lease. Such an agreement was not unilateral but was supported by a valuable consideration including mutual benefits and, therefore, was valid and binding.

Crawford v. Williams, —— Ga. ——, 99 Southeastern 378, p. 381.

DESCRIPTION AND QUANTITY OF LAND.

Evidence of the acreage of land in an oil and gas lease where the number of acres is followed by the words "more or less" has little weight as against specific boundaries. But where a doubt exists as to the actual location of the boundary, and the lease contains no words to definitely fix the line by either metes or bounds or monuments, evidence of acreage becomes a material factor in determining the intention of the parties. In such case it is competent to show that the quantity of land called for in the lease and the quantity included within the boundaries as contended for correspond with each other.

Dawson v. Coulter, —— Pa. ——, 106 Atlantic 187, p. 188.

DEATH OF LESSOR—RIGHT TO REMOVE MINERALS—OPEN MINES.

Mines opened under a lease executed prior to the death of the lessor and that give power and authority to enter, mine and remove the mineral products subject to rents and royalties reserved, will be considered open mines at the time of the lessor's death, though then not actually opened, so far as the right of the wife to dower or the husband to curtesy in such royalties is concerned.

Bramer v. Bramer, —— W. Va. ——, 99 Southeastern 329, p. 330.
See Alderson v. Alderson, 46 W. Va. 242, 33 Southeastern 228.

CONTRACT TO PURCHASE ORE—SCHEDULE OF PRICES—MARKET PRICE.

A mining lease provided that the lessee was to deliver all merchantable ore which should be accounted for by the lessor upon the terms and conditions of its schedule and announcement of prices being paid by it at its mill at the time of the shipment. There was nothing in the lease showing that the parties intended to make the schedule and announcement of prices at all times conform to the prevailing market prices. The language employed can not be construed to mean that the lessor should pay the market price or that any price was intended other than the one scheduled and announced by him.

Wolf Tongue Min. Co. v. Hinman, —— Colo. ——, 182 Pacific 16.

SALE OF ORE—SCHEDULED PRICES—PAROL EVIDENCE TO CHANGE.

A mining lease fixed the prices to be paid for ore according to a schedule and announcement of prices by the lessor paid by it at its mill at the time of shipment. Under such a lease and contract parol evidence was not admissible to show that the parties intended or agreed that the schedule or announced prices should correspond with or be the same as the prevailing market prices for such ore.

Wolf Tongue Min. Co. v. Hinman, —— Colo. ——, 182 Pacific 16.

COAL LEASES.

MINIMUM ROYALTY—CONSTRUCTION OF LEASE—MISTAKE—FORFEITURE.

A lease of a coal mine provided for the payment of $1,000 per year as a minimum royalty and to cover the first 10,000 tons to be mined. It also provided for the payment of a royalty of 10 cents per ton for all coal mined in excess of the 10,000 tons. Effect must be given to the language used that provided for monthly settlement and the payment of royalties each month, but where there was a controversy over the construction of the lease as to the payment of the royalty and when a small sum was claimed to be due as royalty, the mistaken party will not be penalized to the extent of enforcing a forfeiture against him. The lessor in his action asked no judgment except that of forfeiture and in view of the length of the term created by the lease, the probable value of the improvements as contemplated by its terms, the amount of coal mined under the lease, the comparatively small amount due from the lessee, and the fact that the lessor demanded the sum claimed but one day before the bringing of the suit, will not justify a court of equity in decreeing a forfeiture of the lease. Equity has always been jealous of the right of forfeiture and has never enforced it unless the right has been so clear and insistent as to permit of no denial.

Harlan v. McGraw, —— Wash. ——, 181 Pacific 882, p. 884.

ROYALTY ON INFERIOR COAL.

A lessee of a coal lease who mined and used inferior coal not required to be mined by the lease must pay royalty as prescribed by the lease upon other coal which the lessee was required to mine and use. Under such a lease when the lessee took coal of any quality he took it as coal for which the royalty fixed by the lease must be paid.

State v. Hobart Iron Co., —— Minn. ——, 172 Northwestern 899.
See Genet v. D. & H. Canal Co., 136 N. Y. 593, 32 Northeastern 1078.
Genet v. D. & H. Canal Co., 186 N. Y. 422, 79 Northeastern 437.
Ellis v. Cricket Coal Co., 166 Iowa 656, 148 Northwestern 887.
Flavelle v. Red Jacket, etc., Co., —— W. Va. ——, 96 Southeastern 600.

DEATH OF LESSOR—RIGHT OF LIFE TENANT TO ROYALTIES.

Where a coal mine was opened and operated under a lease during the lifetime of the deceased, the husband on the death of the lessor, his wife, as the life tenant by curtesy was entitled to the whole of the royalties due from subsequent operations under the lease.

Caudill v. Wagoner, —— Ky. ——, 212 Southwestern 422.

DEATH OF LESSOR—RIGHTS OF REMAINDERMEN AS AGAINST LIFE TENANT.

Coal mines leased by a married woman were opened and operated during her lifetime. Upon her death during the term of the lease her surviving husband became the owner of the land as life tenant by curtesy. The lease was subsequently abandoned by a purchaser from the original lessee, who thereupon purchased the fee in the coal land from the remaindermen, the children of the deceased lessor. As the land had been impressed as mineral land and the mines opened and operated in the lifetime of the lessor, all royalties from coal mined belonged to the husband as life tenant by curtesy, the remaindermen inherited their interest in the land with this burden imposed upon it and a purchaser from the remaindermen took no greater interest in the land than that owned by them and the rights of such a purchaser were subject to the life tenant's rights therein.

Caudil v. Wagoner, —— Ky. ——, 212 Southwestern 422.

PAROL AGREEMENT TO LEASE—SPECIFIC PERFORMANCE.

The lessee of a coal mine who under a parol agreement entered into by the agents and officers of a coal-mining corporation entered into the possession of the property and made valuable permanent improvements under the assurance that a formal lease in accordance with the parol agreement would be executed by the mining corporation, is entitled to have the parol agreement specifically enforced.

Oberman v. Red Rock Fuel Co., —— W. Va. ——, 99 Southeastern 66, p. 74.

RIGHTS OF LESSEE AS AGAINST RECEIVER.

The holders of the bonds of a mining company that had defaulted in payment of interest consented to a lease of the mining property and the lessee entered into possession, made valuable and permanent improvements, and was in good faith conducting the mining operations. Subsequently the bondholders directed the trustee to foreclose the trust deed and in the foreclosure proceedings a receiver was appointed who took possession and operated the mining property. Upon the final determination of the controversy a decree was entered to the effect that the bondholders were estopped to contest the validity of the lease and the lessee was granted the right to resume operations. The lessee was entitled to an accounting by the receiver for the personal property taken over and the coal mined during the time he had been in possession less the agreed royalty, but he was not to be charged with any portion of the compensation allowable to the receiver for his services.

Oberman v. Red Rock Fuel Co., —— W. Va. ——, 99 Southeastern 66, p. 75.

SALE OF LEASE—APPLICATION OF DEPOSIT—LIABILITY OF BANK.

The Ryegate Coal Mining Company held a lease of certain coal land and agreed to sell and assign the lease free from all encumbrances held upon the land by the State by reason of debts due the State by the mining corporation. A part of the consideration was to be paid in cash and the balance by a credit to be given the corporation upon an account due from it to a third person. It was agreed that the cash and the receipted bill should be deposited in a bank to be held as an escrow in trust and to be paid over to the mining company when the State charges had been paid. On information that the State's charges had been paid and the lease free from encumbrances, the bank was authorized to apply the deposit of money to a debt due it from the mining corporation and it could not be held liable to the purchaser of the lease because he was unable subsequently to give the bond required by the State.

Glendening v. Slaten, —— Mont. ——, 179 Pacific 819.

SUIT TO FORFEIT—AMENDMENT OF COMPLAINT.

A coal mining lease required the lessee to pay a minimum royalty of $1,000 per year to cover the first 10,000 tons or less of coal mined. The payments were to be at the rate of $100 per month. The lessee was to pay on all coal mined in excess of the first 10,000 tons per year a royalty of 10 cents per ton, payable monthly. It was stated in the lease that time was the essence of the contract and on failure of the lessee to pay in full any year's rental or his failure to perform any of the conditions of the lease then it might be forfeited and terminated at the option of the lessor. In an action to forfeit the lease the lessor averred that there was a large sum due as royalties and that liens had been filed against the mine amounting to large sums. The lessee denied these allegations and alleged that all the claims had been fully paid. At the time the case was called for trial the lessor asked leave to amend the complaint by an averment that the lessee had committed great waste in mining in that he had thrown out and used as ballast upon a railroad track a large amount of coal for which no account had been made. The suit was for a forfeiture and cancellation of the lease only, and as the lease gave the lessor the right of oversight and inspection of the mining operations, and as he permitted the lessee to mine and use coal for ballast and to exclude the material so used from the royalty account, he was not entitled to claim a forfeiture by reason thereof, at least until after demand, and he was not entitled to make the proposed amendment to his complaint.

Harlan v. McGraw, —— Wash. ——, 181 Pacific 882, p. 883.

FORFEITURE—LABOR LIENS.

A coal mine lease required the lessee to operate the mine and to pay a stipulated annual royalty to cover the required number of tons to be mined, and pledged the entire mining equipment for the payment of all royalties, and the lien of the lessor on the mine equipment was to be prior to all labor liens. Under these provisions the filing of labor liens upon the property was not such a breach of the lease as would warrant a forfeiture, where the liens had been fully paid before the suit was instituted to forfeit the lease.

Harlan v. McGraw, —— Wash. ——, 181 Pacific 882, p. 884.

OIL AND GAS LEASES.

CONSTRUCTION—CONVEYANCE OF MINERAL RIGHTS—DEFEASANCE.

A lease or conveyance provided that the lessee or grantee was to have and hold for a term of five-years and as much longer as gas, oil, gold, silver, coal, lead or zinc was produced in paying quantities from the land. The instrument, though designated as an oil lease, was a conveyance of the mineral rights in the land subject to defeasance either for failure to drill a well or pay the rentals stipulated and subject to the further contingency of a termination of such title after the expiration of the five-year period by failure to discover any of the mineral in paying quantities.

Key v. Big Sandy Oil & Gas Development Co., —— Tex. Civ. App. ——, 212 Southwestern 300, p. 301.

CONSTRUCTION OF CONTRACT—IMPLIED COVENANT TO DEVELOP.

In order to enable a purchaser of a certain tract of land to acquire a merchantable title thereto and in order to effect an adjustment of the rights and interests of the holder of an enforceable contract with the owner for an oil and gas lease thereon and for the purchase of an interest in the lands, the purchaser entered into a written contract with the holder of the contract for the oil and gas lease to the effect that in consideration of a release of the outstanding contract and a quit claim deed to the premises and other agreements mutually entered into whereby the holder of the original contract reserved the oil and gas appurtenant to the premises for a term of 15 years with the privilege of entry and accompanying developing rights. There was no implied covenant in such a contract that required the lands to be explored and developed with reasonable diligence as is commonly required in the case of an ordinary oil and gas lease.

Kroeger v. Martin, —— Okla. ——, 180 Pacific 955, p. 957.

CONSTRUCTION—DEVELOPMENT DELAYED—UNFORESEEN CONTINGENCIES.

It is not unreasonable to say that the parties when executing an oil and gas lease and contemplating the production of oil, had in view that by the happening of some untoward event, or the failure of the lessee's expectations to be realized within the time that might reasonably be expected, the lessee might be delayed beyond the term of the lease in producing oil or gas in paying quantities; but if he was diligently and efficiently prosecuting the work of development at the termination of the time stated, and had theretofore demonstrated that the land was oil producing land it was within the contemplation of the parties that he might continue at least the operations in which he was then engaged to their completion and if the operations resulted in the production of oil or gas in paying quantities, they would have the same result under the clause extending the lease beyond the fixed term as though this result had been accomplished during the period named. But such operations, to be effective, must be vigorous, diligent, and efficient, convincing that the real purpose was to strike "pay dirt" at the earliest possible moment.

Ohio Fuel Co. v. Greenleaf, —— W. Va. ——, 99 Southeastern 274, p. 279.

CONSTRUCTION—TIME AS ESSENCE.

In an oil and gas lease time is ordinarily of the essence of the contract and a proper construction of the language used will not limit the lessee to the particular term mentioned in the lease where he has demonstrated that the leased land is underlaid with oil or gas and is proceeding with all diligence in an efficient manner to produce the oil or gas therefrom in paying quantities.

Ohio Fuel Oil Co. v. Greenleaf, —— W. Va. ——, 99 Southeastern 274, p. 279.

CONSTRUCTION—PURPOSE—RIGHTS AFTER EXPIRATION.

An oil and gas lease was given for the term of one year and as long thereafter as oil or gas was produced from the demised premises. The purpose of the lessor was to have the oil and gas produced and marketed so that he might receive the royalties therefrom, and this purpose is a material element to be considered in the construction of such a lease. Such a lease does not justify operations after the expiration of the specified term, unless within that time oil or gas has been produced in paying quantities, or unless within such time the lessee has demonstrated that the land is underlaid with oil or gas and he is at the expiration of the time making diligent and efficient efforts to produce it in paying quantities. But under such a lease the lessee can not upon the discovery of a trace of oil or gas, lie idle and insist that this discovery vested in him a right to produce oil and gas at any time he might choose to operate in the future.

Ohio Fuel Oil Co. v. Greenleaf, —— W. Va. ——, 99 Southeastern 274, p. 276.

CONSTRUCTION—CONSIDERATION—BEGINNING OF RENTAL PERIOD.

An oil and gas lease provided that the lessee should complete a well on the leased premises within one year from its date or pay at the rate of $20 for each additional year completion was delayed. No time was fixed in the lease as to when the rentals should become due and payable. Applying the strict rule of construction as against the lessee and in favor of the lessor the rental was payable in advance at the beginning of the year for which it was to be paid.

Maud Oil & Gas Co. v. Bodkin, —— Okla. ——, 180 Pacific 959, p. 960.
See Bearman v. Dux Oil & Gas Co., —— Okla. ——, 166 Pacific 199.
Dill v. Fraze, 169 Ind. 53, 79 Northeastern 971.

CONSTRUCTION—DELAY RENTALS—ACCEPTANCE AVOIDS FORFEITURE.

Where an oil and gas lease provided for the payment of a certain annual rental in case a well was not drilled within a stated time, the payment and acceptance of annual rentals was a full discharge of the obligations of the lease. But the lessor could at any rental period decline to further accept the rentals and require the lessee to begin operations for oil or gas. The agreement to pay the rental was absolute if the well was not drilled, and if not paid the rent was recoverable, and if not paid the lease could be forfeited. But the payment and acceptance of rentals fully and completely extended the agreement to explore from time to time until it was complied with by the completion of a well. A lessee was not in fault in not drilling a well within a year and the payment or the deposit of the rental according to the lease was a waiver of the right to declare a forfeiture.

Ohio Valley Oil & Gas Co. v. Irvin Development Co., —— Ky. ——, 212 Southwestern 110, p. 112.
See American Window Glass Co. v. Indiana Natural Gas & Oil Co., 37 Ind. App. 439, 76 Northeastern 1007.

CONSTRUCTION—MUTUALITY.

An oil and gas lease was for a stated term of years or as long as oil or gas was produced, and provided that operations should be commenced within one year or if not the payment of a certain stated annual rental, and gave the lessor a certain royalty on the oil and gas produced. Such a lease is not void for want of mutuality, and is not a unilateral contract.

Ohio Valley Oil & Gas Co., v. Irvin Development Co., —— Ky. ——, 212 Southwestern 110, p. 112.
See Hughes v. Parsons, 183 Ky. 584, 209 Southwestern 853.

CONSIDERATION—CASH BONUS—MUTUALITY—SURRENDER CLAUSE.

An oil and gas lease provided that the lessee should commence drilling a well within one year from its date or pay an annual rental of $20. The lease also provided that the lessee might at any time upon the payment of the further sum of one dollar surrender the lease for cancellation and all payments and liabilities thereafter accruing would terminate. The lease was made in consideration of a cash bonus of one dollar. The down payment, or cash bonus, the consideration in the lease, supports all of its covenants and such a lease is not subject to cancellation merely because of the presence of the surrender clause.

Maud Oil & Gas Co. v. Bodkin, —— Okla. ——, 180 Pacific 959, p. 960.
See Rich v. Doneghy, —— Okla. ——, 177 Pacific 86.
Northwestern Oil & Gas Co. v. Branine, —— Okla. ——, 175 Pacific 533.
Overruling Brown v. Wilson, —— Okla. ——, 160 Pacific 94.

CONSIDERATION—MUTUALITY—SURRENDER CLAUSE—TERMINATION.

A landowner executed an oil and gas lease for certain lands for a term of five years for a cash consideration of $240. The lessee agreed to pay to the lessor one-eighth of the oil produced and to pay a stipulated sum per annum for each gas well. The lessee was to complete a well on the premises within twelve months from the date of the lease or pay $240 quarterly in advance for each year such completion was delayed. The lease contained the provision that upon the payment of one dollar at any time to the lessor, the lessee should have the right to surrender the lease for cancellation. Such a lease is not unalateral and is not void for want of mutuality, and the cash bonus supports each and all of the covenants of the lease and although no well had been commenced on the premises, the lessor had not the option to refuse timely tender of payments and terminate the lease.

Magnolia Petroleum Co. v. Saylor, —— Okla. ——, 180 Pacific 861.
See Northwestern Oil & Gas Co. v. Branine, —— Okla. ——, 175 Pacific 533.
Rich v. Doneghey, —— Okla. —— 177 Pacific 86.
Shaffer v. Marks, 241 Federal 151.

CONSIDERATION—RESCISSION IN PART.

An action brought to annul in part and leave undisturbed in part an oil and gas lease affecting a large tract of land referred to as a single unit, though composed of many tracks, proceeded upon the theory of a subsisting contract, notwithstanding an allegation that the lease was void from its inception. Such a contract being indivisible the complainant had no standing while holding on to benefits received and being received and while unable or unwilling to restore the status quo ante, to demand that it be annulled in those respects wherein he disapproved or derived no profits from its execution and be maintained or continued in those respects wherein he had found it profitable. The rights and obligations of such a contract considered as a whole are so interpendent and so real to the whole body of the land that they can not be divorced from each other or from the land.

Nabors Oil & Gas Co. v. McCormick, 145 La. ——, 81 Southern 766, p. 767.

PAROL LEASE—PRESUMPTION AND VALIDITY.

A lessee of oil and gas producing property who has been in possession under a parol lease and conducting operations thereon for many years and accounting for the royalties to the owner, is presumed to be a parol lessee, or the facts justify the inference that he occupies the status of a parol lessee.

Drake v. O'Brien, —— W. Va. ——, 99 Southeastern 280, p. 283.

PAROL LEASE—VALIDITY—STATUTE OF FRAUD—TENANCY.

A parol lease for oil and gas is not valid if for a term of more than five years by reason of the inhibition of the statute of frauds; but a parol lease together with possession thereunder and payment of the royalties for many years creates at least a valid tenancy from year to year terminable, if at all, only by statutory notice, or until extinguished in some other proper form.

Drake v. O'Brien, —— W. Va. ——, 99 Southeastern 280, p. 284.

POWER OF ONE COTENANT TO LEASE—PAROL LEASE.

A tenant in common of oil-producing property having authority from his cotenant to lease the premises for oil production without limitation, except as to the amount of the royalties to be reserved, conferred upon him by the deed of his cotenant, may make a valid parol lease of the premises for exploration for oil or gas within the limitations prescribed by law.

Drake v. O'Brien, —— W. Va. ——, 99 Southeastern 280, p. 283.

RIGHTS OF COTENANTS.

A cotenant in partition proceedings where the land was ordered sold subject to an oil lease is entitled to an accounting for the rents and royalties arising from the oil produced and marketed from the premises.

Miller v. Powers, —— Ky. ——, 212 Southwestern 453, p. 456.

RIGHT OF COOWNER TO LEASE JOINT PROPERTY.

Coowners are owners of part and of the whole and as neither has exclusive right to any determinate part of the property the owner of an undivided half of a tract of land has not the right to exploit the land for oil and gas by making a lease therefor without the consent of his coowner and he can not confer such right upon his lessee. Such a lease may be valid as to the lessor but it is void as to his coowner.

Gulf Refining Co. v. Carroll, 145 La. ——, 82 Southern 277, p. 278.
See Gulf Refining Co. v. Hame, 135 La. 555, 70 Southern 512.

SALE OF PART OF LAND SUBJECT TO LEASE.

A purchaser of a part of a tract of land that has been leased to another for oil and gas operations takes the same subject to such lease. If the lessee thereafter discovers and produces oil or gas from the unsold residue of the leased premises, the purchaser of the other part is not entitled to an apportionment or share of the royalties accruing from the oil and gas so produced.

Kimbley v. Luckey, —— Okla. ——, 179 Pacific 928, p. 931.

DIVISION OF LEASED LAND—RIGHTS OF PURCHASERS.

Where an oil and gas lease is made to extend to the heirs, administrators, and assigns of both the lessor and lessee, and before the discovery and production of oil or gas thereon a part of the leased premises is conveyed to a third person, each owner is entitled to the profits and royalties arising and accruing from oil and gas produced on his separate tract, free of any claim or demand of the other. The purchaser takes the tract purchased by him subject to the oil and gas lease and he is not entitled to any apportionment or share of the royalties accruing from oil and gas produced on the part of the land retained by the original lessor.

Pierce Oil Corp. v. Schacht, —— Okla. ——, 181 Pacific 731, p. 733.
See Kimbley v. Luckey, —— Okla. ——, 179 Pacific 928.
Osborn v. Arkansas Territorial Oil & Gas Co., 103 Ark. 175, 146 Southwestern 122.
Fairbanks v. Warrum, 56 Ind. App. 37, 104 Northeastern 983, 1141.
Northwestern Oil & Nat. Gas Co. v. Ullery, 68 Ohio St. 259, 67 Northeastern 494.

LEASE OF HOMESTEAD—WIFE NOT JOINING.

The owners of certain lands entered into an agreement with oil well drillers to execute leases on their several tracts of land. The wives of the land owners did not join in the execution of the agreement. Parts of the land affected by the agreement were homesteads of the several parties and under the statute the agreement as to such land was null and void.

Haynie v. Stovall, —— Tex. Civ. App. ——, 212 Southwestern 792, p. 794.

MOTIVES FOR EXECUTION—DEVELOPMENT.

Owners of land because of their inability to develop their property leased the mineral rights to persons prepared and equipped to do development work. Development of the property and collection of royalties are the purposes uppermost in the minds of the lessors in the making of such leases and a lessee will not be permitted to postpone development for an unreasonable length of time or to extend the lease indefinitely by the payment of a mere nominal rent.

Ohio Valley Oil & Gas. Co. v. Irvin Development Co., —— Ky. ——, 212 Southwestern 110, p. 111.

See Dinsmore v. Combs, 177 Ky. 740, 198 Southwestern 58.

CONTRACT FOR LEASE—RESERVATION OF OIL AND GAS.

A person holding an enforceable contract for an oil and gas lease and for an interest in land may contract in respect thereto and may in making a settlement and adjustment of his rights enter into a contract with the grantee of the person with whom he formerly contracted and he may, in such contract, reserve to himself the oil and gas beneath the lands conveyed. The time when the drilling operations shall commence is a proper subject of agreement between the parties and in the absence of fraud and mistake the grantees will be held to their undertaking in that respect.

Kroeger v. Martin, —— Okla. ——, 180 Pacific 955, p. 958.

LEASE BY STATE—DRILLING IN STREAM BEDS—INJUNCTION.

The Statute of Louisiana authorizes the Governor to lease the beds of streams and lakes belonging to the State for oil and gas operations. The statute also provides that in case of dispute as to the title of stream beds the lessee shall not be enjoined from drilling but the oil and gas shall be judicially sequestrated until the title is determined. Under these statutes a lessee of the State drilling for oil and gas in a stream bed may be entitled to an injunction to prevent a land owner, claiming title to the stream bed, from interfering through force and violence with the lessee in his operations for oil and gas in the beds of certain named streams.

Wemple v. Eastham, 144 La. ——, 81 Southern 438, p. 439.

OIL LEASE BY INDIAN ALLOTTEE—FILING FOR RECORD—CONSTRUCTIVE NOTICE.

The Act of March 1, 1907 (34 Stats. 1026), provides that the filing of any lease in the office of the United States Indian Agent shall be deemed constructive notice. This provision was neither repealed, annulled, nor modified by the subsequent admission of Oklahoma into the Union, by the recordation statutes of the Territory or State, by the Enabling Act, the constitution, or the schedule to the constitution of the State. An Indian lease filed in the office of the United States Indian Agent is constructive notice to subsequent purchasers or lessees of the land.

Anchor Oil Co. v. Gray, 257 Federal 277, p. 281.

DESCRIPTION OF LAND—PAROL EVIDENCE TO EXPLAIN.

Where a latent ambiguity exists in the description of land in an oil and gas lease parol evidence is admissible to explain such ambiguity and to show that a certain fence had been agreed upon as the actual division line on the ground. Such evidence does not contradict the written lease but tends to explain its terms by giving locality and identity to the subject matter.

Dawson v. Coulter, —— Pa. ——, 106 Atlantic 187, p. 188.

DESCRIPTION OF LAND—NOTICE OF EXISTING LEASE.

An oil and gas lease described the land as being bounded on one side by land previously leased to a third person. Although the lease referred to had not been recorded, it was sufficient to put the lessee upon inquiry as to the terms of the former lease to ascertain the true location of a boundary line that was otherwise uncertain.

Dawson v. Coulter, —— Pa. ——, 106 Atlantic 187, p. 188.

LAND OMITTED BY MISTAKE—RIGHT OF LESSEE—INJUNCTION.

An oil company leased an entire tract of land in a known oil territory. By mutual mistake one acre of the tract was omitted from the lease. After the oil company began operations third persons purchased the one acre tract and immediately began drilling operations. At the suit of the oil company the purchasers of the one acre tract were temporarily restrained but on final hearing the temporary injunction was dissolved. The dissolution of the injunction was on the theory that injunction was not the proper remedy, for the reason that if the injunction should prove to be wrongful and the parties enjoined were rightfully entitled to proceed the extent of recovery on an injunction bond would be impossible to determine with certainty. If a well on the one acre tract should prove to be a dry hole the complaining oil company could not be damaged; but if oil should be produced the court could protect the rights of the true owners as finally established by a receivership or by some other equitable proceeding.

Texas & Pacific Coal & Oil Co. v. Howard, —— Tex. Civ. App., ——, 212 Southwestern 735, p. 739.

RIGHT TO EXTENSION OF LEASE—DISCOVERY OF GAS WITHIN LEASED PERIOD.

An oil and gas lease was to be operative for the period of five years and so long as gas or oil should be found in paying quantities. The lessee drilled a well and discovered gas in quantities sufficient to transport within the five-year period. After striking this gas the lessee decided to and did drill deeper and in a short time after the expiration of the lease struck gas but did not find oil or gas in the lower sand within the period prescribed by the lease. The right of extension of the lease, once vested by the discovery of gas in the upper sand was not lost by the lessee's continuance to drill deeper in search of oil or gas in the lower sand. But on failure to find oil or gas in the lower sand, the production from the upper sand could not long be deferred without incurring the penalty of abandonment or forfeiture.

Roach v. Junction Oil & Gas Co., —— Okla. ——, 179 Pacific 934, p. 936.

DISCOVERY OF OIL OR GAS—CONDITION FOR EXTENSION.

An oil and gas lease provided that it should be operative for a period of five years, or so long as gas, oil, or other minerals were found in paying quantities. When the lessee found gas within five-year period in quantities large enough to transport he then became vested with a limited estate in the leased premises for the purpose of transporting the gas according to the terms of the lease. The lease did not mean that the gas should in fact be transported within five years.

Roach v. Junction Oil & Gas Co., —— Okla. ——, 179 Pacific 934, p. 936.

TERM OF LEASE—PRODUCTION OF OIL AND GAS—EXTENSION OF LEASE.

An oil and gas lease contained a provision to the effect that it should be operative for a period of five years from date or so long as gas, oil, or other minerals were found thereon in paying quantities. At the expiration of the term it became a condition precedent to the extension of the lessee's right to continue operations beyond the five-year period to show that oil and gas or either of them had been found upon the premises in paying quantities within five years from the date of the lease.

Roach v. Junction Oil & Gas Co., —— Okla. ——, 179 Pacific 934, p. 935.

PERIOD OF DURATION—EXTENSION OF TERM—RIGHTS OF LESSEE.

The fact that a well was drilled on the premises described in an oil and gas lease, but did not produce oil in paying quantities, did not exhaust the lessee's right under the lease to continue his efforts to obtain oil. This right continued to the end of the term named in the lease and if he did not, before the end of such term, produce such oil in the quantities contemplated, then his right to further explore therefor ceases. The specific term mentioned may be extended beyond the period fixed by its literal terms, but this extension of time within which the lessee may produce oil in paying quantities, so as to meet the requirements of the lease, does not depend on anything other than the proper construction of the contract. The term "as oil or gas is produced" means as long as the premises are diligently and efficiently operated, provided minerals had been discovered within the fixed term.

Ohio Fuel Oil Co. v. Greenleaf, —— W. Va. ——, 99 Southeastern 274, p. 278.
See South Penn Oil Co. v. Snodgrass, 71 W. Va. 438, 76 Southeastern 961.

PAYMENT FOR GAS—EXTENSION OF LEASE.

An oil and gas lease provided that if gas was found in quantities large enough to transport, the lessor was to receive $100 per year for the product of each well so transported and also free gas for his dwelling on the premises. The lease was for five years or so long as gas or oil should be found in paying quantities. Upon the discovery by the lessee of gas in quantities large enough to transport the lessor was entitled to $100 per year for the product of each well so transported. The amount of the lessor's revenue did not depend upon the amount of gas transported, but was a fixed and definite sum, with the additional privilege of the use of gas for domestic purposes. So long as the lessor received payment of the $100 per annum and had the use of gas for domestic purposes no other revenue or consideration from the lessee could be claimed. If the lessee failed to transport the gas and declined to pay the $100 per annum or furnish gas for domestic purposes, then the lessor might declare a forfeiture for nonperformance.

Roach v. Junction Oil & Gas Co., —— Okla. ——, 179 Pacific 934, p. 936.

PERIOD OF DURATION—EXTENSION OF TERM—ESTOPPEL.

Where the lessor in an oil and gas lease that gives the lessee a specified term in which to discover oil or gas, by his conduct and by accepting the benefits thereunder, leads the lessee to believe that he will not insist upon the production of oil in paying quantities within the specified term, he will not on the expiration of such term be allowed to say that the lessee's rights are at an end, if the lessee at such time is diligently prosecuting the work of exploration in such manner as may be reasonably expected to produce oil or gas from the premises in remunerative quantities.

Ohio Fuel Oil Co. v. Greenleaf, —— W. Va. ——, 99 Southeastern 274, p. 279.

DISCOVERY OF MINERALS—TERMINATION OF PERIOD.

The lessee in an oil and gas lease takes upon himself enormous risks and burdens in consideration of his covenants when he drills a well upon the premises. At the time of the execution of such a lease neither party intended the general and indefinite terms employed by them to be used as instruments of extreme hardship by the operation of technical rules. The clause "operate within the specified term" is uniformly construed and applied so as to work out equitable and just results. The mere discovery of a dry hole does not end a lease under a forfeiture clause for failure to drill a well within a stipulated time. The test of duty and right are diligence and good faith in almost all cases when the terms, read in the light of the conditions and circumstances, will permit their observance.

Ohio Fuel Oil Co. v. Greenleaf. —— W. Va. ——, 99 Southeastern 274, p. 278.

DIVISION OF LEASED LAND—EXTENSION OF LEASE BY DRILLING WELL.

A lessor of a departmental oil and gas lease duly approved sold separate subdivisions of the leased premises to different parties after the restrictions were removed. The lessee after subdivision entered into written contracts with the different owners to the effect that the oil and gas rentals and royalties were to be deposited at different designated places. These facts did not make the lease a separate lease upon each of the subdivided tracts of land, but it remained a lease upon the entire tract and the drilling of a well upon any portion thereof and the payment of the royalty on any oil and gas produced as provided in the lease to the owner of the portion of the land where the well was drilled extended the life of the lease upon the entire tract of land although subdivided.

Pierce Oil Corp. v. Schacht, —— Okla. ——, 181 Pacific 731, p. 733.

FAILURE TO DEVELOP—RIGHT OF LESSOR.

Full protection may be accorded the lessor of an oil and gas lease with respect to the enforcement of the implied covenant of the lessee to use due diligence in mineral development without making a breach of the covenant a ground of forfeiture. The lessee can not abandon his contract without subjecting it to cancellation on that ground, and the power of a court of equity in decreeing specific performance is far reaching and such power has been exercised in proper cases to compel either performance or abandonment by a lessee of an oil lease. Where the lessee removed his drilling machinery from the land and for nine years conducted no prospecting or drilling or producing operations his rights were lost by abandonment.

Grubb v. McAfee, —— Tex. Civ. App. ——, 212 Southwestern 464, p. 467.
See Kleppner v. Lemon, 198 Pa. 591, 48 Atlantic 483.
Conkling v. Krandusky, 127 App. Div. 9, 112 N. Y. Supp. 13.

FAILURE TO DEVELOP—IMPLIED COVENANT—REMEDY FOR BREACH.

An implied covenant may exist to reasonably operate the premises, but there is no implied or express covenant on the part of the lessee to leave the premises and forfeit his lease for a breach of such implied covenant. A lease provided for a forfeiture for the failure to comply with its conditions or to pay the cash consideration according to the agreement, but a breach of the implied covenant to reasonably operate the premises was not included in the causes of forfeiture. Where some causes of forfeiture are expressly mentioned none others can be implied. The remedy for a breach of the implied covenant to reasonably operate the premises is therefore not by way of forfeiture of the lease, but must be sought in a proper action for a breach of the covenant.

Grubb v. McAfee, —— Tex. Civ. App. ——, 212 Southwestern 464, p. 466.
See Harris v. Ohio Oil Co., 47 Ohio St. 131, 48 Northeastern 506.
Poe v. Ulrey, 233 Ill. 65, 84 Northeastern 50.

FAILURE TO DRILL—ANNUAL RENTAL—RECOVERY FOR FIRST YEAR.

An oil lease provided that it should continue for a period of ten years and as long thereafter as oil or gas was produced and if drilling was not begun within one year, the lease should terminate unless the lessee should elect to continue it in force by paying an annual rental of $35. The unambiguous terms of the lease contemplated the right upon the part of the lessee at the end of the first year to continue the lease upon the payment in advance of the annual rental provided. The lessee at the end of the first year paid the sum of $35 and thus continued his rights for another year. Under the lease the lessor was not entitled to recover the annual rental for the first year.

Sullivent v. Clear Creek Oil & Gas Co., —— Ark. ——, 211 Southwestern 173, p. 174.

TIME FOR DRILLING—TERMINATION OF CONTRACT—TENDER TO BANK.

An oil and gas lease provided that it should terminate if the lessee should fail to begin operations for a well on or before a stated date, unless the lessee should before that date pay or tender to the lessor or to the credit of the lessor in a certain stated bank a stated sum. Under the lease the bank stood in the place of the lessor and was to receive for him the money to be paid by the lessee and when the check or draft or money was paid or tendered to the bank, the lessee could exercise no further ownership or control over it and it then belonged to the lessor. It was paid to and received by the bank for the lessor. Under the lease the bank was the sole agent of the lessor.

Texas Co. v. Wimberly, —— Tex. Civ. App. ——, 213 Southwestern 286, p. 289.
See Beatty Oil Co. v. Blanton, 245 Federal 979.
Lafayette Gas Co. v. Kelsay, 164 Iowa 569, 74 Northeastern 9.
Friend v. Mallory, 52 W. Va. 53, 43 Southwestern 114.

AGREEMENT TO DRILL WITHIN A YEAR—RIGHTS WHERE WELL WAS DRILLED.

An oil and gas lease given for a cash consideration was for a term of five years, and on the further condition that the lessee was to complete a well within one year or pay a certain rental per acre per annum until the well was completed. A well was drilled within the year according to the terms of the lease, and the contractural consideration for drilling having been fully performed, the lessee was under no obligation to drill another well in order to hold the lease for the full five-year period.

Key v. Big Sandy Oil & Gas Development Co., —— Tex. Civ. App. ——, 212 Southwestern 300, p. 301.

NUMBER OF WELLS NOT SPECIFIED—IMPLIED OBLIGATION.

In the absence of an express covenant when the lessee undertook to develop oil or gas lands on a rental or royalty basis and the contract did not specify the number of wells, there was an implied obligation that the lessee would fully develop the land with reasonable diligence.

Grubb v. McAfee, —— Tex. Civ. App. ——, 212 Southwestern 464, p. 465.
See Rice v. Black, 26 Iowa 356, 26 Northwestern 1056.
Brewster v. Lanyon Zinc Co., 140 Federal 801.

AGREEMENT TO COMPLETE WELL—MEANING.

An oil and gas lease provided that the lessee was to complete a well on the premises within one year or pay a certain specified rental. The lessee assigned the lease to an oil-drilling company and the assignee drilled a well to the depth of 2,000 feet. The discovery of oil had been expected at a depth of 1,700 or 1,800 feet, and on reaching the depth of 2,000 feet, the lessor agreed with the lessee that the well was completed within the meaning of the terms and conditions of the lease. If the agreement in the lease to "complete the well" was ambiguous, the subsequent consent and agreement of the lessor that the well drilled to a depth of 2,000 feet was a complete well within the meaning of the lease was binding upon the lessor.

Key v. Big Sandy Oil & Gas Development Co., —— Tex. Civ. App. ——, 212 Southwestern 300, p. 301.

DISCOVERY OF OIL—VESTED RIGHT—ABANDONMENT.

The discovery of oil or gas under a lease giving the right of exploration and production is sufficient to create a vested estate in the lessee in the exclusive right to produce oil or gas, but this right may be lost by abandonment, by failure to produce oil or gas, or pursue the work of production or development of the property.

Ohio Fuel Oil Co. v. Greenleaf, —— W. Va. ——, 99 Southeastern 274, p. 278.
See Eastern Oil Co. v. Coulehan, 65 W. Va. 531, 64 Southeastern 836.

LEASE BY WIFE—DEATH OT LESSOR—HUSBAND AS LIFE TENANT.

An antenuptial agreement by which after the marriage the wife should hold and enjoy her separate estate does not cut the surviving husband out of his curtesy or his inheritanre and does not deprive him or his legal heirs from their right to moneys received as royalties on oil for well drilled under a contract with and in the lifetime of the wife.

Bramer v. Bramer, —— W. Va. ——, 99 Southeastern 329, p. 332.

DEATH OF LESSOR—RIGHT OF LIFE TENANT—OPEN MINES.

The lessee in an oil and gas lease after the death of the lessor entered upon the leased premises and drilled and produced oil and gas. Oil and gas wells so drilled are regarded as open mines at the time of the lessor's death and the life tenant will be entitled to the rents, issues, and profits reserved to the lessor accruing from such wells during the life tenancy.

Bramer v. Bramer, —— W. Va. ——, 99 Southeastern 329, p. 330.

COMMISSION FOR PROCURING LEASE—RECOVERY.

In an action by a broker to recover commissions under a verbal contract made at a specific date by which he was to receive a stated amount for commission, after having effected an oil lease of the real estate of the defendant, the broker after alleging a certain contract can not recover on proof of a contract different in character and made at another time. The fact that a landowner employed a broker to obtain a lease for him did not prevent the landowner himself from making a lease of his land.

Dickinson v. Robinson, 145 La. ——, 82 Southern 398, p. 399.

PARTNERS BUYING AND SELLING LEASES—COMPLIANCE WITH STATUTE—VALIDITY OF CONTRACT.

Persons engaged as partners under a fictitious name in the business of buying and selling leases are prohibited from doing business without filing a certificate in the office of the county clerk. An oil and gas lease executed or assigned by a firm that failed to comply with the statute is unenforceable by the partnership, but such a contract is not void. The other party to such a lease or assignment may at his option enforce specific performance against the partnership or have a cancellation of the lease on proper proof.

Warren Oil & Gas Co. v. Gardner, —— Ky. ——, 212 Southwestern 456, p. 458.

ASSIGNMENT—MODIFICATION OF CONTRACT—CONSIDERATION.

The owner of oil leases assigned certain shares of stock and his interest in other oil leases in consideration of an agreement on the part of an assignee of the first leases to drill a test well. Subsequently the assignee sold an interest in the tract and the purchaser assumed the obligation of drilling the test well. The purchaser of the interest from the assignee commenced the work of drilling but refused to continue drilling operations and complete the well. Thereupon the contract to drill was modified and the original owner of the oil leases was permitted to drill a well and by agreement was to use the equipment furnished by the purchaser from the assignee of an interest in the leases. This agreement by which the owner was to drill the well was not without consideration but the contract and the arrangement by which the purchaser of the interest from the assignee was to drill the well constituted a sufficient consideration for the subsequently modified contract and under these facts the owner of the leases was entitled to an injunction to restrain the purchaser of the interest of the assignee from removing the oil drilling equipment from the premises and from the possession of the owner of the leases under the contract by which permission was given the latter to use the well drilling equipment.

Hinton v. D'Yarmett, —— Tex. Civ. App. ——, 212 Southwestern 518, p. 522.

ASSIGNMENT OF LEASE—RESCISSION—DILIGENCE.

The lessors in an oil and gas lease can not have a decree rescinding the assignment of the lease where they failed to offer to rescind promptly upon discovering the facts on which they based their claim to a rescission and failed to give any reason for any rescission promptly and where they did not offer to restore what they had received under the contract.

Duncan v. Keechi Oil & Gas Co., —— Okla. ——, 181 Pacific 709, p. 711.

ASSIGNMENT OF MONEY RENTALS—REGISTRATION.

A mining lease of certain lands was given in consideration of the payment of a certain sum in cash with the right of renewal by paying in advance each year a like amount of rental. The lease was duly recorded as required by the statute. Subsequently the lessors for a valuable consideration assigned and conveyed to a certain named bank all their right, title, interest and claim to the annual rentals, royalties, and benefits due them under the terms of the lease and authorized the cashier of the bank to collect and receipt for the same and guaranteed the payment of the annual rentals, but this assignment was not recorded. The assignment of the definite and specific amount to become due at the time fixed in the lease was a complete disposition of the rentals so far as the lessors were concerned. The assignment of the money rentals was not subject to the registration laws nor the law merchant. It was not a deed, conveyance, or instrument, concerning lands or tenements within the meaning of the registration statute but was personal property, a negotiable chose in action.

Farmers' & Merchants' State Bank v. Tullos, —— Tex. Civ. App. ——, 211 Southwestern 847, p. 848.

ALTERATIONS BY LESSEE—RIGHTS OF LESSOR.

An oil and gas lease was executed in duplicate, each party retaining his copy as an original. The duplicates as executed provided for a yearly rental of $240 payable quarterly in advance, pursuant to an agreement to pay the lessor at the rate of $1.50 per acre for the 160 acres included in the lease. The lessee without authority from the lessor changed his duplicate from $1.50 to $1, making the annual rental $160 and the quarterly payment $40 instead of $60.

After the alterations had been made the lessee sold and assigned the lease to an oil company that had no knowledge of the alteration. Within the time stipulated the assignee paid the lessor the quarterly payment of $40. The lessor accepted the $40 and signed a receipt reciting that that sum was in full for the quarter and extended the life of the lease for three months. The lessor received the $40 quarterly payments for a year without objection, but when reminded, or upon examination, discovered that the original lease called for $1.50 per acre or $60 per quarter, refused to accept the amount. The assignee of the lease thereupon offered to pay the $60 per quarter, but the lessor refused this payment on the ground that the alteration by the original lessee rendered the lease void. The alteration made by the lessee in his duplicate could not affect the rights of the lessor; but the acceptance of the $40 quarterly payments by the lessor for a year without objection and with some information as to the alteration of the lease and the reason why it had been made were sufficient to estop the lessor from demanding the full quarterly payment of $60 or declaring the lease void.

Magnolia Petroleum Co. v. Saylor, —— Okla. ——, 180 Pacific 861, p. 864.

SALE—FRAUDULENT REPRESENTATION—AVOIDANCE.

Each of four persons owned an undivided one-fourth interest in an oil and gas lease on a certain tract of land. An oil company in drilling a well on a near-by tract discovered oil that greatly enhanced the value of the lease in question. Two of the joint owners of the lease, with knowledge that oil had been discovered in the well drilled, purchased the interest of the other two joint owners, who at the time had no knowledge of the discovery of oil. The purchasers concealed the fact that oil had been discovered and told them that the well in process of drilling was likely to be a dry hole, but that the entire lease could be sold as a unit at the price they were offering. The price paid for the part interest was a little more than one-tenth of what the purchasers a few days later received for the sale of part of the lease. In the purchase of the interest in the lease there was no positive misrepresentation of a material fact, but the statement in reference to the well was made in the form of the expression of an opinion, and where an opinion was expressed for the purpose of deceiving as to a matter which was within the knowledge of the person expressing it, it ceased to be a matter of opinion and was thereby made the means of a misrepresentation or concealment of a fact and may form the predicate for actionable fraud.

Zundelowitz v. Waggoner, —— Tex. Civ. App. ——, 211 Southwestern 598, p. 599.

FRAUD—CANCELLATION—JURISDICTION OF COUNTY COURT.

An oil company filed its petition in a county court asking an order requiring a guardian to repay to the oil company a $1,600 bonus paid by it for oil leases upon the lands of the minors represented by the guardian on the ground that the guardian secured the approval of the oil leases by fraudulent representation. Jurisdiction to cancel orders and judgments of the county court fraudulently obtained is possessed by the district superior courts and a county court has no jurisdiction to cancel and set aside any such order or judgment.

Johnson, In re (Twin State Oil Co. v. Johnson), —— Okla. ——, 179 Pacific 605. p. 607.

CANCELLATION AND RESCISSION—DUTY OF LESSOR—DILIGENCE.

A lessor of an oil and gas lease invoking the jurisdiction of a court of equity to cancel and rescind the lease for the breach of an implied covenant must come into court with "clean hands," and he must act with reasonable diligence after the discovery of his right to a forfeiture of the lease on account of its breach.

Pierce Oil Corp. v. Schacht, —— Okla. ——, 181 Pacific 731, p. 734.
See Indiana Oil, Gas & Development Co. v. McCrory, 42 Okla. 146, 140 Pacific 610.
Wellsville Oil Co. v. Miller, 44 Okla. 493, 145 Pacific 344.
Michigan Pipe Line Co., In re, 111 Federal 284.

CANCELLATION—PROOF INSUFFICIENT.

The owners of certain oil and gas leases assigned the same to third persons in consideration that the assignee develop the leases and drill a test well. The leases provided that if a test well was not begun in 30 days the assignors were to receive $500 liquidated damages. With the knowledge and consent of the assignors, the assignee assigned his interest in the leases to an oil drilling company that undertook to perform the conditions of the leases. An action by the assignors to cancel the assignment of the lease could not be maintained where it appeared that no false representations were made as to the ability of the assignee to drill the test well and no proof was shown that the assignee or the second assignee had in fact breached the contract but where it was shown that the assignors made no objections as to the time the drilling operations were commenced and where the proof showed that oil was found in paying quantities.

Duncan v. Keechi Oil & Gas Co., —— Okla. ——, 181 Pacific 709, p. 710.

CONTRACT FOR OIL LEASE—SUIT TO CANCEL.

The owners of certain lands entered into an agreement with oil-well drillers to the effect that the land owners would execute leases as of the printed form attached to the agreement giving to the first parties the right to drill for oil upon their lands. As a part of the consideration for the contract the well drillers were to attempt to secure the release of an existing lease upon the lands of the several owners and the new leases were to be executed within five days of the final securing of the release of the existing lease. After the execution of the agreement the well drillers secured the release of the existing lease. The land owners were not entitled to a cancellation of the contract on the ground that the well drillers had failed to comply with the terms of the written agreement and on the ground that the contract became executed under the rule that equity regards as done that which ought to be done although new leases were not formally executed.

Haynie v. Stovall, —— Tex. Civ. App. ——, 212 Southwestern 792, p. 794.

ABANDONMENT—INTENTION.

Whether an oil and gas lease had been terminated by abandonment on the part of the lessee and the acceptance of or reentry upon the premises by the lessor is a question of intention. A lease so terminated is said to have come to its end by operation of law, the legal result arising from the acts of the parties. The intention on the part of the lessee to abandon and on the part of the lessor to resume possession of the premises on his own account and treat the lease as having been surrendered and as ascertained from their acts and conduct is the test.

Grubb v. McAfee, —— Tex. Civ. App. ——, 212 Southwestern 464, p, 468.

ABANDONMENT—RIGHT TO FORFEITURE.

A lessee drilled a well on the premises within the time required and discovered oil at a depth of 250 feet. The well produced oil for some 60 days and then failed entirely. The lessee drilled two other wells, but found no oil, and thereupon removed all machinery, equipment, and supplies from the land and for 9 years had conducted no drilling or producing operations. Under these facts the lessor was entitled to a judgment forfeiting the lease on the ground of abandonment.

Grubb v. McAfee, —— Tex. Civ. App. ——, 212 Southwestern 464, p. 465.

CONTRACT TO DRILL—ABANDONMENT—RIGHTS AND LIABILITIES.

An oil-well driller agreed with an oil company to pull the pipe from a certain well and to clean it out for the sum of $1,000, but nothing was to be paid if the driller did not put the well in good shape for pumping. The oil company was to furnish the necessary tools and supplies with which to work. The oil company failed to furnish the tools and supplies as required by the agreement but did advance to the driller the sum of $395 with which to purchase tools and supplies. The driller abandoned the contract and the well because of the failure of the oil company to furnish the tools and supplies according to the contract. An assignee of the oil company was not entitled to recover the money advanced where the damages of the driller caused by the failure of the oil company to furnish the tools and supplies exceeded the amount advanced by the oil company.

Hoppes v. Williams, —— Tex. Civ. App. ——, 213 Southwestern 328, p. 329.

FAILURE TO DEVELOP—FORFEITURE—NOTICE TO LESSEE.

The right of a lessor to forfeit an oil and gas lease for non-development can not be arbitrarily exercised. He must first notify the lessee that he will no longer accept the annual rentals and permit the land to remain undeveloped, but he must demand of the lessee that he execute the lease according to the intention and demand that he develop in good faith the leased lands. If the lessee, after such notice and demand, fails to begin the development within a reasonable time the lessor may then have the lease forfeited.

Ohio Valley Oil & Gas Co. v. Irvin Development Co., —— Ky. ——, 212 Southwestern 110, p. 111.
See Warren Oil & Gas Co. v. Gilliam, 182 Ky. 807, 207 Southwestern 698.
See Monarch Oil & Gas Co. v. Richardson, 124 Ky. 602, 99 Southwestern 668.

FORFEITURE—NOTICE OF CONDITIONS.

An oil and gas lease provided that the lessor might declare the lease forfeited upon giving 10 days' notice, but the provision was not complied with by the lessor merely notifying the lessee that he had declared the lease forfeited. In order to comply with such a provision in a lease it is necessary for the lessor to notify the lessee of the terms of the lease that have been violated and to demand that if the same were not complied with within 10 days then the lease would be declared forfeited.

Pierce Oil Corp. v. Schacht, —— Okla. ——, 181 Pacific 731, p. 734.

FAILURE TO DRILL—FORFEITURE.

An oil and gas lease for a term of 20 years required the lessee to begin a well within 30 days and to continue to drill until oil was found in paying quantities or until a depth of 300 feet was reached. The lease also provided that a failure "to drill said well as above provided shall render this instrument of writing null and void as to all parties hereto." The lessee did begin to drill within 30 days and prosecuted the work with diligence until oil was found at the depth of 250 feet, and the well produced oil for some 60 days when it ceased to produce. The lessee sunk two other wells within 12 months without finding oil, and thereupon removed his machinery, equipment, and supplies, and for nine years conducted no prospecting or drilling upon the land. The lease specified as the sole cause of forfeiture the failure to drill the first well within the time or to the depth specified. The law implied an obligation on the lessee to exercise reasonable diligence to continue drilling and mining operations on the land after oil was encountered in the first well, but the lease did not make this obligation a condition subsequent and authorize a forfeiture for noncompliance with that obligation.

Grubb v. McAfee, —— Tex. Civ. App. ——, 212 Southwestern 464, p. 465.

FORFEITURE—CONTROVERSY AS TO TERMS—FAILURE TO GIVE NOTICE.

The lessor in an oil and gas lease claimed the right to forfeit the lease because of the failure to pay the delay rentals and advance royalties in the sum of $52 due and payable June 19, 1910. In September, 1910, the lessor permitted the lessee to enter upon the premises and drill a gas well and permitted the lessee to pay for a period of three years the royalties due under the lease to the owner to whom that part of the leased premises had been conveyed. Thereafter the lessee took possession of the portion of the premises still belonging to the lessor over his protest but without any proceedings and drilled three producing oil wells thereon at a large cost and thereupon tendered to the lessor the royalties due him under the lease. Under such circumstances a court of equity would not enforce a forfeiture for the failure to pay the $52 rental, and particularly so where there was a controversy as to whether or not the rental was due and where no notice was given by the lessor before attempting to declare a forfeiture.

Pierce Oil Corp. v. Schacht, —— Okla. ——, 181 Pacific 731, p. 734.

RIGHT TO FORFEITURE—ACCEPTANCE OF RENTS—WAIVER.

A lessor in an oil and gas lease, after cause of forfeiture has accrued, who fails to signify to the lessee his intention in some unequivocal manner to avoid the lease and thereafter accepts rentals in lieu of development waives his right to declare the forfeiture.

Maud Oil & Gas Co. v. Bodkin, —— Okla. ——, 180 Pacific 959, p. 960.

FORFEITURE—JUDGMENT PROCURED BY FRAUD—RELIEF.

A coal mining lease provided that the lessee was to pay a royalty of eight and one-third cents per ton and was to mine sufficient coal to insure to the lessors an income of not less than $50 a month. Operations were to begin as soon as possible after the lease was executed. After mining operations had been conducted for some time by an assignee of the lease, suit was brought by the lessors to cancel the lease and to recover royalties due. One of the lessors representing the plaintiffs in the action falsely and fraudulently represented to the president of the mining company, the defendant in the action, that if the company would not appear and permit a judgment by default forfeiting the lease that the lessors would thereupon execute a new lease to the mining company on the same terms as the existing lease. Relying upon the representations the mining company permitted the judgment by default forfeiting the lease but the lessor refused thereafter to execute a new lease to the mining company. Upon proof of these facts and a showing that the mining company had a good defense to the original action the company was entitled to have the default judgment set aside and to be permitted to defend the action.

Krypton Coal Co. v. Eversole, —— Ky. ——, 212 Southwestern 421.

FORFEITURE—ACCEPTING BENEFITS—ESTOPPEL.

A lessor in an oil and gas lease can not claim a forfeiture where he has so conducted himself as to lead the lessee to believe that a claim of forfeiture would not be made for a failure to produce oil or gas in paying quantities within the specified term mentioned in the lease.

Ohio Fuel Oil Co. v. Greenleaf, —— W. Va. ——, 99 Southeastern 274, p. 280.

QUIETING TITLE—EQUITY JURISDICTION.

Equity has jurisdiction at the suit of the holder of a valid oil and gas lease, whose rights have become vested by the discovery of oil or gas to remove as a cloud upon his rights a subsequent lease executed to a stranger by the lessor covering the same tract of land.

Ohio Fuel Oil Co. v. Greenleaf, —— W. Va. ——, 99 Southeastern 274, p. 276.
See Carbon Black Co. v. Ferrell, 76 W. Va. 800, 85 Southeastern 544.

CONFLICTING RIGHTS—EQUITABLE JURISDICTION.

Equity is the proper forum to adjudicate all issues arising between claimants under conflicting oil and gas leases executed by the same lessor on the same tract of land.

Ohio Fuel Oil Co. v. Greenleaf, —— W. Va. ——, 99 Southeastern 274, p. 277.

MINING PROPERTIES.

TAXATION.

PHOSPHATE LANDS—BASIS OF VALUATION.

When an assessor has not sufficient knowledge or information of the real value of a mineral deposit upon which to base a fair and equitable valuation he should assess the land upon some basis of known value obtainable as required by law.

Camp Phosphate Co. v. Allen, —— Fla. ——, 81 Southern 503, p. 510.

PHOSPHATE LANDS—METHOD OF ASCERTAINING VALUE.

Valuations of phosphate lands for taxation must have a just relation to the real and known value of the property assessed and not to some unknown and speculative value and there must be no substantial inequality in valuations in the various kinds and items of property that are subject to tax. The statute of Florida does not require an assessor to prospect land to ascertain if it contains valuable mineral deposits; nor does it compel the owner to expend a large sum prospecting his land for the information of a tax assessor. If an assessor by the exercise of a small degree of interest might not have found it necessary to assess large tracts of land known to him to be nonmineral at an excessive fictitious value in order to assess a deposit of phosphate which by some unknown means he estimated to contain 2,000 tons, when it was a matter of common knowledge where phosphate mining had been carried on that a deposit of less than 10,000 or 15,000 tons of phosphate is of no value for mining purposes and adds no value to the land. Under such conditions a court of equity may properly interfere to restrain the collection of such a tax.

Camp Phosphate Co. v. Allen, —— Fla. ——, 81 Southern 503, p. 510.

ASSESSMENT OF PROPERTY—ERRORS OF JUDGMENT.

Mere errors of judgment by taxing officers in the assessment of phosphate lands will not support a claim of discrimination; but there must be something which in effect amounts to an intentional violation of the essential principles of practical uniformity. The good faith of taxing officers and the validity of their actions are presumed and when these are assailed the burden of proof is upon the complaining party.

Camp Phosphate Co. v. Allen, —— Fla. ——, 81 Southern 503, p. 507.

ASSESSMENT OF SMELTER—JURISDICTION OF COURT TO GIVE RELIEF.

A taxpayer was dissatisfied with the amount of his assessment as fixed by the State tax commissioners and the board of equalization on his mills and smelters for the reduction of ore. In a suit by the taxpayer the court decreed that the taxes levied by the tax commissioners were excessive and that the assessment should be fixed in the sum of $2,000,000. Under the statute the court was without jurisdiction as the matter was wholly within the province of the State tax commission's duty.

State v. International Smelting Co., —— Ariz. ——, 181 Pacific 951.
State v. Inspiration Consol. Copper Co., —— Ariz. ——, 181 Pacific 955.

APPEAL FROM ASSESSMENT—JURISDICTION OF COURT.

The valuation for assessment of certain mining property was changed by the State tax commissioner from the value fixed by the taxing officers of the county. The mine owner paid the taxes under protest and gave notice of appeal by filing the notice in the office of the clerk of the board of supervisors. The protest was addressed to the county treasurer, the tax collector. When a property owner has invoked the procedure authorized in paragraph 4887 (R. S. A. 1913), and proceeded to a final judgment in the superior court no appeal is provided for to the supreme court. The protest with the notice and receipt of payment of the taxes accompanying the protest filed in the superior court is the complaint paragraph 390 requires to be filed in order to commence a civil suit in the superior court for contesting and determining the full cash value of taxable property when the value placed thereon by the county authorities is not satisfactory to the taxpayer. The determination reached in such proceeding is equivalent to a final judgment and under the statute an appeal lies from such determination. The taxpayer's ground for protest is his ground for action and the rights asserted by his protest filed have never been determined by any board, officer, tribunal or court and the matter is not before the board for the purpose of review of any prior determination, but is there for the purpose of an original inquiry into and determination of the right of the taxpayer as set forth in his protest.

State v. Inspiration Consol. Copper Co., —— Ariz. ——, 181 Pacific 955, p. 957.

ASSESSMENT OF FOREIGN OIL COMPANY—AUTHORITY OF TAXING OFFICERS.

The State Tax Commission of Arizona has supervision of the system of taxation and over the administration of the assessment of taxes and may assess property, franchises, and all intangible values of public service corporations. The State Board of Equalization has authority to equalize the assessments and values of property throughout the State and fixes the rate of taxation for State purposes and all property is required to be taxed at its full cash value. But there is no statutory authority in Arizona for the taxation of the earnings of the Standard Oil Company, a foreign corporation, nor is there any provision which authorizes the taxing officers to judge what earnings are excessive or as to how heavily such earnings may be taxed. The State Board of Equalization has no power to determine the "excessive earnings" of a foreign corporation or its "intangible" property, not included in the term "real estate." The Board of Equalization is not authorized to make a valuation on what is known as the "capitalized income plan" and the board can not increase the valuation of the property of such a corporation on that part of the capitalized income and above the value of the tangible property on the theory that it resolves itself into a simple assessment of intangible property.

Standard Oil Co. v. Howe, 257 Federal 481, p. 485.

FOREIGN CORPORATION—ASSESSMENT OF INTANGIBLE PROPERTY.

The Standard Oil Company of California owned within that State, pipe lines, refineries, oil wells, and property valued at more than $40,000,000. The company sold its products in other States and in the conduct of its business owned in the State of Arizona tangible property valued at more than $300,000. The Arizona Board of Equalization determined that the oil company's profits on its Arizona sales for the year were over $727,000 and proceeded to capitalize these earnings at 25 per cent and thereby arrived at a total value of $2,900,000. From this sum the board deducted the cash value of the tangible property in the State and fixed the taxable property of the corporation at the difference between these sums. This sum was divided among the counties in proportion to their several contributions to the corporation's gross sales without reference to the actual value of the properties involved and the counties were directed to enter upon their assessment rolls: "Tangible and intangible valuation on property above enumerated based on excessive earnings." In the matter of the assessment the State board considered not merely the earnings and income produced by the oil company in Arizona but in far greater part took into consideration the earnings and income produced by the property of the oil company in California. The income as considered included the oil company's entire profits upon all crude petroleum produced by it and sold in Arizona, as well as the whole profit upon the oil company's manufacture and sale of manufactured products distributed in that State. The valuation of the property as determined by the Board of Equalization was unauthorized and the assessment of taxes illegal.

Standard Oil Co. v. Howe, 257 Federal 481, p. 485.

ILLEGAL ASSESSMENT—RIGHT TO INJUNCTION.

The statute of Arizona (sec. 4887, R. S. 1913) gives a taxpayer dissatisfied with the amount of his assessment the right to appeal to the superior court of the county and prescribes the procedure. Section 4939 of the same statute expressly provides that no injunction shall ever issue to prevent or enjoin the collection of any tax but provides that the taxpayer may recover any tax illegally collected in the manner pointed out by the statute. A Federal court in the exercise of its equitable jurisdiction is not bound by this section of the Arizona statute which forbids injunctions against the taxing officer to prevent the collection of a tax where it appears that the action of the State Board of Equalization was fundamentally erroneous in principle and the assessment was unwarranted by law; but a Federal court will give injunctive relief where the remedy under the statute would involve a multiplicity of suits upon a question of law common to all and where a single action at law would not suffice.

Standard Oil Co. v. Howe, 257 Federal 481, p. 487.

TANK CARS—OWNERSHIP AND OPERATION—TAXATION.

The statute of Florida (Compiled Laws 1914, sec. 596a), imposes a license tax upon any corporation owning, controlling, or operating tank cars. This act can apply only to corporations engaged in the business of owning, controlling, or operating such cars; and a corporation engaged in producing, buying and selling oils and oil products that owns and uses tank cars for the sole purpose of transporting its own products by reason of the failure of the railroad company to provide such cars is not engaged in the business of owning tank cars.

Texas Co. v. Ames, —— Fla. ——, 81 Southern 471.

MINERS' LIENS.

NATURE OF WORK.

The work for which a lien on a mine or mining property is given is that which is performed in the development and conservation of the mine and the results of which become incorporated with the mine so as to constitute a part of its value.

International Trust Co. v. Lowe, —— Colo. ——, 180 Pacific 579, p. 580.

PERSONS ENTITLED TO LIEN—GENERAL MANAGER.

A general manager of a mining company stands very much in the position of an owner directing and managing his own business. He is the representative of the corporation, and to the laborers under him he is practically the corporation itself. Such a manager does not come within the spirit of the mechanics' lien acts and he is not entitled to a lien on the mine or mining property for services rendered, as against bondholders, where as such general manager, he aided in the issue of the bonds.

International Trust Co. v. Lowe, —— Colo. ——, 180 Pacific 579, p. 580.

MINING SUPERINTENDENT—RIGHT TO LIEN.

Section 4 makes the provisions of the Colorado statute applicable to all persons who shall do work or shall furnish materials as provided in section 1. Section 1 gives a lien to engineers who have furnished "surveys or superintendence," or "who have rendered other professional or skilled services." Under these two sections a mining superintendent may acquire a lien on a mine whose working he has superintended.

International Trust Co. v. Lowe, —— Colo. ——, 180 Pacific 579, p. 580.

TIME LIENS ACCRUE—RELATION.

Section 6 of the lien act of 1899 makes all liens relate back to the commencement of the work; but the furnishing of material is not mentioned. The general provision is that "all liens established by virtue of this act shall relate back" and this broad and inclusive language must prevail as against a special limitation from the use of the word "work." The statute refers to the commencement of the work, the beginning of operations under the contract, and not to the labor of some mechanic or laborer.

International Trust Co. v. Clark Hardware Co., —— Colo. ——, 180 Pacific 300.

SEPARATE ITEMS—SINGLE TRANSACTION.

Where all the items in an account for a miner's lien relate to one transaction, it constitutes a continuous transaction within the meaning of the Colorado lien law.

International Trust Co. v. Clark Hardware Co., —— Colo. ——, 180 Pacific 300.

See Fields v. Daisy Gold Mine Co., 25 Utah 7, 69 Pacific 528.

CONTRACT FOR SUPPLIES—MONTHLY PAYMENT—RUNNING ACCOUNT.

The manager of a mining company made an agreement with a hardware company for such mining supplies as should be needed in the operations of the mining company and payments therefor were to be made monthly. Such an agreement justifies a finding that there was an arrangement for a running account within the meaning of the Colorado lien law.

International Trust Co. v. Clark Hardware Co., —— Colo. ——, 180 Pacific 300.

TRESPASS.

JOINT ACTION BY TENANTS IN COMMON.

Tenants in common of mining property must joint in actions ex delicto for an injury to their common property. A cause of action for nonpayment of rent, breach of covenant for good mining, and removal of the property of the lessors is in the tenants jointly and their remedy is joint.

Himes v. Schmehl, 257 Federal 69, p. 71.

QUARRY OPERATIONS.

FAILURE TO FURNISH MEDICAL AID.

It is the duty of a quarry operator in an emergency created by an accident to render to an injured employee such immediate first aid, as well as prompt medical and surgical attention, as was reasonably possible under all the circumstances. Failing in this the quarry company was guilty of negligence in not using active diligence.

Hunicke v. Meramec Quarry Co., —— Mo. ——, 212 Southwestern 345.
See Hunicke v. Meramec Quarry Co., 262 Mo. 560, 172 Southwestetrn 43.

NEGLIGENCE OF OPERATOR—HORSES FRIGHTENED BY BLAST.

It was actionable negligence for a quarry operator to fire blasts in a quarry without warning in such manner as to frighten a team of horses properly driven into the quarry and to cause them to run away. Under these circumstances the quarry company was liable for injuries to the driver received while he was attempting to prevent the team from running away.

Slinkard v. Lamb Construction Co., —— Mo. App. ——, 212 Southwestern 61, p. 64.

NEGLIGENCE OF FOREMAN—LIABILITY OF OPERATOR.

A granite quarry operator assumed the duty of determining the stability of the pieces of granite in his quarry upon which he directed his employees to work. Having assumed this duty the operator is liable at common law for its negligent performance by his foreman, to whom he had entrusted it, and an employee would not be at fault for failing to ascertain whether the operator had performed this duty.

Tierney v. New England Granite Works, —— New Hampshire ——, 106 Atlantic 481, p. 842.

EMPLOYEE OBEYING INSTRUCTIONS—KNOWLEDGE OF DANGER—RECOVERY.

An employee in a quarry was injured while inserting with his hands a wedge beneath a stone in obedience to the directions of the foreman. The injury occurred in Pennsylvania and the statute of that State expressly provides that where a servant in obedience to the requirement of the master incurs a risk which though dangerous is not so much so as to threaten immediate danger or where it is reasonably probable it may be safely done by extraordinary caution or skill, the master is liable for the resulting injury. Under this statute, where an employer gives an employee to understand that he does not consider a particular act one which a prudent person should refuse to undertake, the employee has a right to rely upon his master's judgment unless his own is so clearly opposed thereto that in fact he does not rely upon his employer's opinion. A servant is not called upon to set up his own judgment against that of his superiors, and he may rely upon their advice and still more upon their orders notwithstanding any misgivings of his own. The employee's dependent and inferior position is to be taken into consideration; and if the employer gives him positive orders to go on with the work under perilous circumstances the employee may recover for an injury thus incurred if the work was not inevitably and imminently dangerous.

Fillippon v. Albion Vein Slate Co., 39 Supreme Ct. Rep. 435, p. 437.

CONTRIBUTORY NEGLIGENCE—QUESTION OF FACT.

An experienced quarryman was directed by the foreman to prepare a piece of granite for the attachment of chains so that it could be removed by a derrick. It was the foreman's duty to see that the stone was on a secure foundation before directing the workman to split off a piece because of a seam. The workman did split off a piece and was injured while preparing the remainder for removal by the derrick. The work of continuing the preparation of the work after the part was split off was within the contemplation of the foreman when he directed the stone to be split. Whether the foreman was at fault in not ascertaining that the stone was securely placed for all the work necessary to be done and whether or not the workman was guilty of contributory negligence in continuing the work upon the stone were questions of fact to be determined by the jury.

Tierney v. New England Granite Works, —— New Hampshire ——, 106 Atlantic 481, p. 482.

ACTION FOR PERSONAL INJURY—INSTRUCTIONS IN ABSENCE OF PARTIES.

An employee in a stone quarry known as a rubbish hand brought an action to recover for injuries caused by the fall of a stone while he was pushing a wedge under the stone in the presence of and under the express direction of the foreman. After the evidence was heard and the instructions given the jury retired for deliberation, and later the jury submitted to the judge a query as to whether or not the plaintiff was guilty of contributory negligence in pushing the wedge under the stone. The judge in answer to the inquiry, and in the absence of the parties and their attorneys, sent to the jury a general instruction to the effect that if the plaintiff appreciating the danger and in obedience and in spite of the dangers known to him pushed the wedge under the stone with his hands, he was guilty of contributory negligence. The court had no right or business in the orderly trial of a case so to instruct or direct the jury while absent from the court and in the absence of the parties and their attorneys.

Fillippon v. Albion Vein Slate Co., 39 Supreme Ct. Rep. 435, p. 436.

EXERCISE OF CARE—FREEDOM FROM FAULT.

An employee of a coal company was engaged in delivering a wagonload of coal to a quarry company at its quarry. While engaged in unloading the coal the quarry operators in the line of their work fired a blast that frightened the horses attached to the coal wagon and caused them to start to run away. The employee, in attempting to stop the team, received injuries for which he sued. He was not chargeable with such contributory negligence as to defeat his action, because, instead of taking hold of the lines to stop the team, he ran by the side and endeavored to stop the horses by the bridles. He was not a volunteer, but was acting in the line of his duty. His employment necessarily carried with it the duty on his part to protect the team and wagon from injury and if, in the light of the situation, an ordinarily careful and prudent man in charge of a team of horses belonging to his employer would have acted in a like manner, then the employee can not be held as a matter of law to have been guilty of contributory negligence, although his attempt to control the team in point of fact resulted in injury to himself.

Slinkard v. Lamb Construction Co., —— Mo. App. ——, 212 Southwestern 61, p. 64.

DAMAGES FOR INJURIES TO MINERS.

ELEMENTS OF DAMAGES.

ELEMENTS—PROOF OF DECREASED EARNING CAPACITY.

In an action by a miner for damages for injuries it appeared from the evidence that the complainant would "always have a weak arm." Under such evidence it was error for a court in its instructions to assume a decrease in the miner's earning capacity as it might be that the condition of the arm, weakened by the injury, would not necessarily decrease the miner's earning capacity. Under the evidence the fact of the decrease in the earning capacity of the miner was left to inference and argument.

Texas & Pacific Coal Co. v. Ervin, —— Tex. Civ. App. ——, 212 Southwestern 234, p. 235.

INJURY TO LEG.

The loss of a leg might in some instances work less incapacity for earning wages than an injury to the leg. The schedule of the Workmen's Compensation Act of Kansas allows for the loss of a leg fifty per cent of the average weekly wages during two hundred weeks. The act also provides that in case of partial disability not covered by the schedule a workman may receive during the period of partial disability not exceeding eight years sixty per cent of the difference between the amount he was earning prior to the injury and the amount he may be able to earn after such injury. In awarding damages for an injury to a miner's leg the court may be justified in following the latter provision.

Close v. Lucky OK Min. Co., —— Kan. ——, 182 Pacific 392, p. 393.

RELEASE—CONSIDERATION—QUESTION OF FACT.

At the time an employee of a coal company was engaged in unloading a wagonload of coal at a quarry the horses attached to the wagon were frightened by the firing of a blast nearby and started to run away. The employee in attempting to stop the team was injured. Subsequently the injured employee executed to his employer, the coal company, a release of all damages for a stated consideration. The release was a mere recital and was not contractual in a legal sense so as to deprive the injured employee of his right to show the actual consideration or the want of consideration for the signing of the release. It therefore was a question of fact to be determined by the jury whether or not there was any consideration for the execution of the release.

Slinkard v. Lamb Construction Co., —— Mo. App. ——, 212 Southwestern 61, p. 63.

DAMAGES NOT EXCESSIVE.

NOT EXCESSIVE.

A verdict of $4,000 does not of itself raise an inference that it was influenced by passion or prejudice on the part of the jury where the plaintiff, an injured miner, was compelled to undergo much suffering and the evidence tended to show permanent disability affecting two fingers of the right hand and other disabilities still continuing for nearly two years after the date of the accident.

Duran v. Yellow Aster Min. & Mill. Co., —— Cal. App. ——, 181 Pacific 395, p. 397.

EXPLOSIVES.

NEGLIGENCE—PRESUMPTION FROM ACCIDENT.

Proof that a residence was destroyed by fire from a natural gas explosion when a drip pipe in the basement was being cleaned was sufficient to justify a finding that the presumption of negligence from the happening of the accident stood unrebutted.

Willard v. Valley Gas & Fuel Co., —— Cal. ——, 182 Pacific 32, p. 33.

ACCESSIBILITY TO CHILDREN—ATTRACTIVE NUISANCE.

The owner of a quarry and rock crusher kept for use dynamite, fuses, and dynamite caps. The quarry and crusher were upon the rugged side of a hill and the dynamite, fuses, and caps were kept in a box some four feet high with the word "dangerous" printed thereon. The box containing the dynamite and caps was accessible from a path leading up the hill and it was known by the owner that children lived near and were accustomed to pass along the path and to gather about the quarry and crusher. A boy six years old held the lid of the box open with a piece of flooring board and another boy 12 years old reached into and took out the fuses and caps, and in playing with the fuses and caps the six year old boy was injured. Under these circumstances the case was not regarded as coming within the doctrine of attractive nuisance.

Goehenour v. Brown, —— Kan. ——, 180 Pacific 776.

UNEXPLODED SHOTS—LIABILITY.

A mine operator is liable to a miner for injuries caused by an unexploded shot left by a former shift that was working under an employee to whom superintendence had been entrusted.

Alabama Fuel & Iron Co. v. Smith, —— Ala. ——, 82 Southern 30, p. 31.

PROOF OF INSPECTION—ADMISSIBILITY OF CERTIFICATE.

Where oil was inspected in a tank car it was impractical for the inspector to mark and brand and date the package, but the practice was to furnish the data called for by the statute in the form of a certificate and deliver the same to the owner and proposed seller. In an action against a seller of oil for damages for personal injuries caused by an explosion the certificate of the oil inspector was competent evidence as the seller presumptively had a right to act upon the certificate furnished him by the inspector.

Way v. S. L. Collins Oil Co., —— Iowa ——, 173 Northwestern 20, p. 22.

NEGLIGENCE—DEPOSITING HOT ASHES NEAR STORED NITROGLYCERIN.

A manufacturer of nitroglycerin and other high explosives may be guilty of negligence in removing fire, hot ashes and coals from its boiler and placing them near the inflammable material of its boiler house and by reason thereof the boiler house became ignited and caused the stored nitroglycerin and other explosives to explode to the injury of a person working nearby and who was himself without fault.

American Glycerin Co. v. Hill, 255 Federal 841.

CONTRACT FOR PURCHASE OF CAPS—DELIVERY—STATUTE OF FRAUDS.

A mine operator by its agent entered into a contract to purchase mining caps. On the delivery of the caps the mine operator himself refused to accept them but afterwards agreed to receive the caps upon an allowance of a certain per cent for culms. The modification of the contract and the acceptance of the caps as delivered was sufficient to take the original contract of purchase out of the statute of frauds.

Chamberlain v. W. J. Thompson & Co., —— Mo. App. ——, 213 Southwestern 946, p. 497.

STORING OILS—NUISANCE.

It is both a public and a private nuisance for an oil company to store oil, gasoline, kerosene, and other high explosives in warehouses and storage tanks in a thickly settled portion of a city.

McGuffey v. Pierce-Fordyce Oil Association, —— Tex. Civ. App. ——, 211 Southwestern 335, p. 337.

SALE OF GASOLINE FOR COAL OIL—DUTY TO PUBLIC.

It is the duty of a seller of gasoline and coal oil who knows the danger to the health and life incident to the attempted use of gasoline, or any other highly explosive substance similar to gasoline for illuminating purposes, not to sell the same as coal oil suitable for illuminating purposes. This duty the seller owes not only to his buyer, but knowing it is purchased for resale he owes the same duty to all who have occasion to purchase some of the substance.

Cohn v. Saenz, —— Tex. Civ. App. ——, 211 Southwestern 492, p. 494.

WHOLESALER OF OILS—DUTY AND LIABILITY.

A dealer in coal oil who sells to another with knowledge that the purchaser is buying the oil for resale at retail owes a duty to the purchaser and to the public to sell and deliver to the purchaser coal oil, and it was his duty not to deliver in lieu of coal oil a substitute exceedingly dangerous when used for purposes for which coal oil is commonly used. The law imposes upon every one the duty to avoid acts which are in their nature dangerous to the lives and health of others. This doctrine is applied in behalf of persons who have no contractual relation with the original dealer or manufacturer.

Cohn v. Saenz, —— Tex. Civ. App. ——, 211 Southwestern 492, p. 494.

INTERSTATE COMMERCE.

TRANSPORTATION OF NATURAL GAS.

The transportation of natural gas from one State to another is interstate commerce.

West Virginia & Maryland Gas Co. v. Towers, —— Md. ——, 106 Atlantic 265, p. 267.

See West v. Kansas Natural Gas. Co., 221 U. S. 229, 35 L. R. A. (N. S.) 1193.

NATURAL GAS—TRANSPORTATION THROUGH PIPES—DELIVERY TO CONSUMERS—ORIGINAL PACKAGE—STATE REGULATIONS.

Natural gas was imported from West Virginia into Maryland through what is termed a high-pressure line. Before being delivered to consumers the pressure was by means of a regulator reduced when it reached the gates of a community where it was to be distributed to the consumers, and it was then carried through the community in low-pressure mains with which the service lines connected. The pressure was again reduced at various stations before it entered the low-pressure mains with which the service lines were connected. The pressure was reduced because the pressure in the main pipe was too high for service to consumers, and by the reduction of the pressure it was separated from the other gas in the main pipe and forced into the intermediate lines; from thence it could not return to the main line but remained in such intermediate lines to be consumed as needed. Whether the gas was separated from the general bulk of gas and confined in the intermediate pipe lines, where it could not return to the main pipe line and where it must remain until consumed, or whether it was so separated and stored in tanks awaiting consumption, the effect is the same in determining the question whether the original package had been broken and the gas mixed with the common mass of property in the State of Maryland. The fact that there was a constant movement of the molecules of the gas because of the peculiar nature of the property does not affect the determination of the question. The gas before reaching the consumer passed through pipes laid in the streets, which was done under rights acquired from local authorities and also through pipes belonging to the owner of the premises upon which the gas was consumed. These facts aid in characterizing the transaction as being of a local and not of a national nature. When the gas was separated from the bulk of gas in the high-pressure line and forced into the intermediate or low-pressure lines and then into the pipes of the individual consumers, where it could not return to the main line, but remained until it was used, it was such a breaking of the original package as to remove it from interstate commerce and to make it subject to State legislation and a subject of regulation by the public service commission of Maryland.

West Virginia & Maryland Gas Co. v. Towers, —— Md. ——, 106 Atlantic 265, p. 268.

See State v. Flannelly, 96 Kan. 372, 152 Pacific 22.
Pennsylvania Gas Co., In re, 184 App. Div. 556, 172 New York Supp. 1028.
Landon v. Public Utilities Comm. of Kansas, 242 Federal 658.

NATURAL GAS—"ORIGINAL PACKAGE"—APPLICATION.

By the term "original package" as used in interstate commerce it is not intended to limit the articles to those that are capable of being put in the form of a package in the generally accepted meaning of the word, but it may apply to other articles incapable of assuming the form of a package by reason of their physical properties. The term is properly applied to natural gas transported by pipe lines.

West Virginia & Maryland Gas Co. v. Towers, —— Md. ——, 106 Atlantic 265, p. 268.

Bulletin 184

DEPARTMENT OF THE INTERIOR
JOHN BARTON PAYNE, Secretary
BUREAU OF MINES
FREDERICK G. COTTRELL, Director

THE MANUFACTURE OF SULPHURIC ACID IN THE UNITED STATES

BY

A. E. WELLS and D. E. FOGG

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THE MANUFACTURE OF SULPHURIC ACID IN THE UNITED STATES.

By A. E. WELLS and D. E. FOGG.

INTRODUCTORY STATEMENT.

When the United States entered the World War governmental agencies found little definite knowledge available as to the exact capacity of each sulphuric acid plant in the United States to manufacture acid under the stress of a great emergency. It is true that on account of the demand for acid for the manufacture of munitions for the Allies, prior to the entrance of this country into the war, most of the acid plants near industrial centers in the Eastern and Northern States were running at or nearly their maximum capacity, but, for various reasons, many plants in these States and plants in other districts were not.

For a number of years statistics as to the production of acid by the plants of the country were compiled by the United States Geological Survey, but obviously such figures did not give information as to the maximum capacities that might be available for meeting the heavy war requirements, or as to the steps that would have to be taken to bring these capacities into use.

During the summer and early fall of 1917 various attempts were made to obtain the desired information, but no satisfactory or complete data were obtained. Late in 1917, under the authority granted to the Bureau of Mines by the explosives act, the Director of the Bureau of Mines directed A. E. Wells, metallurgist of the bureau, to make a complete survey of the situation. Mr. Wells personally conferred with officials of the acid companies and visited most of the acid plants in the North that are east of the Mississippi River. The information obtained through this personal survey, together with that obtained through the ready cooperation of the subcommittee on acids, and the subcommittee on fertilizers of the Committee on Chemicals of the Council of National Defense, enabled the preparation of a report containing the desired data concerning the sulphuric acid industry. This report was made immediately available to the War Industries Board and to those offices in the War and Navy Departments that were most directly concerned in planning the explosives program and in obtaining the necessary supplies to produce the explosives.

Beginning with this survey and report, the sulphuric acid section of the war minerals investigations of the Bureau of Mines took an active part in all matters pertaining to the sulphuric acid industry during the remainder of the war. Mr. Wells, the chief of the section, was appointed an associate chief of the sulphur, pyrite, and sulphuric acid sections of the War Industries Board. Also, by this direct contact with the War Industries Board, the data obtained by Messrs. R. R. Hornor, H. A. Buehler, and O. Lindstrom, who were in charge, for the bureau, of the investigations concerning the supplies of pyrite and sulphur, were constantly made available to all interested Government agencies. D. E. Fogg, of New York City, was appointed chemical engineer to the sulphuric acid section to make special investigations relating to the acid industry, especially the possible utilization, in an emergency, of those sources of raw material not then being used. Mr. E. E. Corbett, of Brooklyn, N. Y., was appointed chemical engineer to make investigations concerned primarily with the conservation of acid. Direct and intimate contact with the industry was had through the close cooperation with the committee on acids of the Chemical Alliance, this committee during the greater part of 1918 occupying rooms with the acid section of the bureau.

With the ending of the war and the close of the active work of the acid section of the bureau, the suggestion was made by many interested parties that a bulletin be prepared giving some of the fundamental and most important facts regarding the sulphuric acid industry, including a discussion of the technical features of the manufacture of acid. During the war the bureau received a vast number of inquiries in regard to various phases of the industry, and this fact also made such a bulletin seem desirable.

Therefore, the present bulletin was prepared to cover the main facts in regard to the industry in this country, including a discussion of the supplies of sulphur-bearing raw materials, the situation of the acid plants, the principal points in regard to manufacturing processes, and the uses of the acid. No attempt has been made to discuss at length the manufacturing processes, as details differ more or less at the different plants and in general are carefully guarded by the acid companies. A great deal of the data given in this bulletin may be found in various publications, but this is the first publication in which such data have been assembled and made readily available. Most of the data were obtained directly from observation and from cooperating acid companies or from individuals who had been or are now engaged in acid manufacturing and were liberal and generous in making their information available for publication. Care has been exercised to publish no data that were obtained as confidential by the bureau's representatives.

The average acid manufacturer may be already more or less acquainted with most of the information presented in this bulletin, yet it is believed that the bulletin will be of value to those who wish to obtain a general review of the present condition, both the economic and technical, of the sulphuric acid industry in the United States.

ACKNOWLEDGMENTS.

The authors wish to acknowledge the kind courtesies and cooperation of the many men connected with the acid industry who furnished information for the purpose of assisting the work of the bureau in its efforts to serve the country and for aiding the preparation of this bulletin.

Special acknowledgment is made of the valued cooperation of the following men: Mr. Peter Gilchrist, of the Chemical Construction Co.; Mr. Paul Webster, of the Kalbperry Corporation; Mr. A. D. Ledoux, of the Pyrites Co. (Ltd.); Mr. W. D. Huntington, of the Davison Chemical Co.; Mr. A. B. Baker, formerly a lieutenant of the Ordnance Department of the Army, now with J. T. Baker Bros.; Mr. E. L. Larison, superintendent of the acid plant of the Anaconda Copper Mining Co.; members of the Research Corporation; Chas. H. MacDowell, president of the Armour Fertilizer Works; and Mr. M. F. Chase, consulting engineer.

In the preparation of the report use has been made of data concerning pyrite and sulphur supplies obtained by Messrs. R. R. Horner, H. A. Buehler, and O. Lindstrom.

GENERAL REVIEW OF THE SULPHURIC ACID INDUSTRY.

Sulphuric acid is one of the most important of all chemicals, not only because of the large quantities manufactured, but also because of the wide use of the acid in many different industrial works. Sulphuric acid is to the chemical industry what iron is to metallurgy. The general public, however, does not realize this fact, for sulphuric acid does not appear in the finished product as does iron or steel, but is only an intermediate raw material, or is only a means to an end. It is essential in many industries, such for example, as in the manufacture of phosphate fertilizers, explosives, dyes, petroleum products, of various acids other than sulphuric, of ammonium sulphate, aluminum sulphate, and innumerable other chemical and metallurgical products. In recent years in the United States, especially in the East, the demand for sulphuric acid for chemical and metallurgical industries has been an accurate and sensitive barometer of the general business conditions. This demand for acid responds much more quickly to a general slump or boom in the industrial world than does the demand for iron and steel.

The basis for the commercial manufacture of sulphuric acid in this country is the conversion of sulphur dioxide (SO_2) to sulphur trioxide (SO_3) and the uniting of sulphur trioxide with water (H_2O) to form the acid (H_2SO_4). The sulphur dioxide may be formed by burning brimstone, or by burning iron pyrites, and various other metallic sulphides. The reactions involved in the manufacture of the acid are brought about by two processes—the chamber process and the contact process, both of which will be generally discussed in the following pages.

NOMENCLATURE OF SULPHURIC ACID.

As the specific gravity of sulphuric acid can be determined more easily than the strength, acid weaker than 93.19 per cent H_2SO_4 is nearly always spoken of and sold as being of so many degrees Baumé, the Baumé hydrometer being the instrument generally used for determining the specific gravity. The following is a list of the principal commercial strengths of acid, showing the values in Baumé degrees and their H_2SO_4 equivalents as agreed to by the Manufacturing Chemists Association in 1882:

Degrees Baumé.	Per cent H_2SO_4.
50	62.18
60	77.67
66 (oil of vitriol)	93.19

Acids between 93.19 per cent H_2SO_4 and 100 per cent H_2SO_4 are spoken of as so many per cent sulphuric acid, 100 per cent being commonly called monohydrate.

SO_3 dissolves in the monohydrate, giving fuming acid or "oleum." There are three ways of stating the strength of fuming acid: (1) The percentage of free (dissolved) SO_3; (2) the percentage of total SO_3; (3) the equivalent percentage of 100 per cent H_2SO_4—that is, the percentage of 100 per cent H_2SO_4 the fuming acid would make if sufficient water were added to combine with all the free SO_3. For example: Twenty per cent "oleum" would contain 20 per cent free SO_3 and 80 per cent actual H_2SO_4, or would contain 85.3 per cent SO_3, and if sufficient water were added to combine with all the free SO_3 the oleum would make 104.49 per cent of H_2SO_4.

There are a number of books giving formulas and tables for use in sulphuric acid calculations, and data on the physical properties of sulphuric acid. One of the most recent handbooks with such data is that prepared by Sullivan.[a] As such complete tables and calculations are already available in the literature few of these data will be duplicated in this bulletin. However, the following conversion factors are given here for the convenience of the reader, who may not have conversion tables at hand:

1. Fifty-degree B. acid ("chamber acid") contains 50.76 per cent SO_3 or 62.18 per cent H_2SO_4. A stated weight of 50° B. acid multiplied by 0.8 gives the equivalent weight of 60° acid, or multiplied by the fraction $\frac{2}{3}$ gives the equivalent weight of 66° acid.

2. Sixty-degree B. acid contains 63.41 per cent SO_3 or 77.67 per cent H_2SO_4. A stated weight of 60° acid multiplied by 1.25 gives the equivalent weight of 50° acid, or, multiplied by the fraction $\frac{5}{6}$, gives the equivalent weight of 66° acid.

3. Sixty-six degree B. acid ("oil of vitriol") contains 76 per cent SO_3 or 93.18 per cent H_2SO_4. A stated weight of 66° acid multiplied by 1.2 gives the equivalent weight of 60° acid, and multiplied by 1.5 gives the equivalent weight of 50° acid.

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[a] Sullivan, T. J., Sulphuric Acid Handbook, 1918, 239 pp.

GROWTH OF THE SULPHURIC-ACID INDUSTRY IN THE UNITED STATES.

PRODUCTION DURING THE PERIOD 1865 TO 1914.

Notwithstanding the extraordinary consumption due to the demands of the Civil War the production of sulphuric acid in this country in 1865 was only 40,000 tons.[a]

The production of acid increased gradually and steadily between 1865 and 1890, as shown by the following figures:[b]

Growth in production of sulphuric acid in United States, 1865–1890.

Year.	Production as 50° B. acid (tons).
1865	60,000
1870	105,000
1875	150,000
1880	425,000
1885	600,000
1890	765,000

In the period 1890 to 1905 many new plants were put into operation. In fact, in 1900 and 1901 alone the capacity was increased by 37 new plants, making an additional capacity of between 1,200 and 1,300 tons per day. By 1900 the production was approximately 1,600,000 tons, and by 1905 the production was considerably over 2,000,000 tons annually.

The production increased rapidly during the next four or five years, and by 1909 (according to the census report) had increased to 2,750,000 tons, with a total market value of $15,174,886.

Beginning with the year 1911 the United States Geological Survey compiled production statistics. The figures are given below:

Quantity and value of sulphuric acid produced in United States, 1911–1918.

Year.	Total production as 50° B. acid.[a]	Total value.
1911	2,700,000	$17,369,872
1912	2,950,000	18,338,019
1913	3,575,000	22,684,526
1914	3,800,000	24,479,927
1915	4,170,000	32,657,051
1916	6,300,000	73,514,126
1917	7,200,000	87,540,181
1918	[b] 7,450,000	([c])

[a] These tonnages are not exact, because there was some doubt as to the exact strength of certain small quantities of high-strength acid, but are undoubtedly within one-half per cent of the actual tonnages.
[b] From the records of War Industries Board.
[c] Not determined.

The growth of the acid industry during the year prior to 1914 was due very largely to the growth of the fertilizer business in the

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[a] Adams, W. H., Pyrites as a material for the manufacture of sulphuric acid: Jour. Anal. and App. Chem., vol. 5, Nov., 1891, pp. 601–615, Dec., 1891, 661–670; vol. 6, Jan., 1892, pp. 9–23; Feb., 1892, pp. 73–82; Mar., 1892, pp. 142–150. Production statistics. pp. 605, 608.

[b] Census of Manufacturers, Class 1A—Sulphuric, nitric, and mixed acids: Bull. 92, Bureau of the Census, 1908, pp. 15–24.

South, and to the increased amount of oil refining in the East and North. Ingalls.[a] estimated that of the approximately 1,600,000 tons of acid (50° B. basis) made in 1900, 800,000 tons, or nearly 50 per cent, was used in fertilizers, and 320,000 tons, or 20 per cent, was used in oil refining, the remainder, 480,000 tons, being used for pickling steel and for manufacturing other acids and chemical products. The consumption of nearly 500,000 tons for steel pickling and chemical manufacture indicates the rapid growth of these industries in the last decade of the nineteenth century.

By 1914 the production was more than 3,500,000 tons, and of this amount approximately 2,200,000 tons was being used in the manufacture of superphosphate. No data are available as to the disposition of the remainder of this acid to the other industries at that time, but it is estimated that the petroleum industries required about 500,000 tons, the iron, steel, and coke industries about 300,000, domestic explosives about 200,000, and other chemical industries 300,000 tons.

PRODUCTION FROM 1914 TO 1917.

During the last half of 1914 the acid industry in the East was obliged to curtail production, owing to the general upset of conditions in the industries caused by the outbreak of the war. Late in 1914 and early in 1915, however, the Allies began to place heavy contracts for manufactured products and munitions, and the demand for sulphuric acid rose by leaps and bounds. Practically every plant in the East ran at maximum capacity during the period from early 1915 to the time of the signing of the armistice in 1918. During 1915, 1916, and 1917 many new plants were built by private concerns, principally by those concerns engaged in the manufacture of munitions. The production rose rapidly as shown by the preceding table. As the increased demand was primarily for high-strength acid, many of the new plants were for the manufacture of acid by the contact process. Much of the 66° B. acid required was obtained by the concentration of chamber acid, new concentrating apparatus being installed at various chamber plants. The increase in the production of 66° or higher strength acid is shown below:

Production of 66° B. and higher-strength acid, expressed as tons of 100 per cent acid.

Year.	Tons.
1913	810,000
1914	720,000
1915	1,160,000
1916	1,930,000
1917	2,100,000
1918	2,400,000

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[a] Ingalls, W. R., Production and consumption of sulphuric acid in the United States: Mineral Industry, 1906, vol. 15, p. 705.

THE INDUSTRY IN 1918.

In the late summer and early fall of 1917, when it became evident that it would be necessary to supply munitions to possibly several millions of United States troops in France, the matter of obtaining an adequate supply of sulphuric acid for the production of explosives became of even greater importance. It was necessary for the governmental agencies, especially the War Industries Board, to know the exact manufacturing capacity of the country and which plants were being operated to capacity. This information was to a limited extent obtained through the efforts of the subcommittee on acids, and the subcommittee on fertilizers of the Committee on Chemicals, Council of National Defense. The greater part of the data, however, was obtained by a survey, made late in 1917, by the Bureau of Mines.

As a result of this survey the rate of production of acid during the last quarter of 1917 was determined to be approximately 390,000 tons per month (basis 100 per cent H_2SO_4), or approximately 7,500,000 tons per year (basis 50° B.). In order to obtain this production practically all acid plants were being operated at maximum capacity.

At several of the zinc smelters where acid was being made as a by-product in the roasting of zinc ores, brimstone was being used to supplement the sulphur in the ore, but at most of the zinc plants this was not being done because of the peculiar conditions of the contracts under which the acid was sold. As the urgent need for more acid became apparent, late in 1917, these contracts were altered. From January 1, 1917, to November 11, 1918, at practically all the zinc plants brimstone was used to supplement the zinc ore, and every effort was made to operate the chamber and contact plants to the utmost capacity. The total acid manufacturing capacity on January 1, 1918, with the use of brimstone to supplement ores at the zinc plants, was estimated to be about 427,000 tons per month (basis 100 per cent H_2SO_4), or 8,200,000 tons per year (basis 50° B.). Of this total capacity, 29 per cent was at contact plants and 71 per cent was at chamber plants. The total capacity for the manufacture of 66° acid—that is, the capacity of the contact plants plus the capacity of the plants for concentrating weaker acid by heat—was about 226,000 tons per month.

Later in 1917 it became evident that the above capacity would not be adequate to meet the explosives program, with the contemplated enormous increase in the production of smokeless powder and high explosives. As private concerns were not prepared to build enough additional plants to supply the necessary acid, the War and Navy Departments undertook the construction of Government-owned plants. During the first nine months of 1918 additions were made to the plants of several explosives companies, and of other smaller producers, also the Government built acid plants at a number of points, so that on November 11, the date of the signing of the armistice, the total actual manufacturing capacity of the country had been increased to 501,000 tons per month (basis 100 per cent H_2SO_4), or 9,600,000 tons per year (basis 50° B).

The Government acid plants comprised 55,000 tons (basis 100 per cent H_2SO_4) of this capacity; the plants of the explosives manufacturers comprised 58,000 tons, and the remainder, 388,000 tons, was the capacity of the plants owned by the commercial manufacturers of fertilizers, chemicals, and metallurgical by-products. Of this total capacity, 40 per cent was at contact acid plants and 60 per cent at chamber plants.

In addition to the above, at the time of the signing of the armistice there was under construction plants which would have had a capacity of about 37,000 tons per month (basis 100 per cent H_2SO_4). These plants were in all stages of construction, from the point of just being started to approximate completion. Work on these plants was immediately discontinued and they are not included in the following discussions.

ZONAL DISTRIBUTION.

In order to show in more detail the manufacturing capacity in different sections of the country, the acid plants have been segregated into six zones, shown on the accompanying map (fig. 1), as follows:

Zone 1.—Includes all of New England, the New York City, Philadelphia, and Baltimore districts, and also all of Virginia.

Zone 2.—Includes all of the State of New York outside of a radius of 50 miles of New York City, all of Pennsylvania except the extreme eastern part—that is, outside of a zone, say, 50 miles west from the Delaware River—West Virginia, Ohio, eastern Kentucky, and lower Michigan.

Zone 3.—Includes western Kentucky and western Michigan, all of Indiana, Illinois, Missouri, Wisconsin, Iowa, and Minnesota. In this district, of course, the acid plants are principally at the zinc plants in Illinois and in the Chicago district. The plant at Argentine, Kans., is included in this zone.

Zone 4.—Includes all the South—that is, south of the southern boundaries of North Carolina, Tennessee, and Arkansas and east of Oklahoma and the Sabine River, Texas.

Zone 5.—Includes all the territory between zones 3 and 4 and the Pacific Coast States, which comprise zone 6.

Zone 6.—Includes the Pacific Coast States.

Although the boundaries of these zones were rather arbitrarily chosen, they are to a considerable degree logical divisions. In zones 1 and 2 the acid is manufactured for a wide variety of purposes, as these zones cover primarily the largest manufacturing centers of the country. In zone 3 the production is essentially a by-product from zinc-smelting operations, although some acid is made by com-

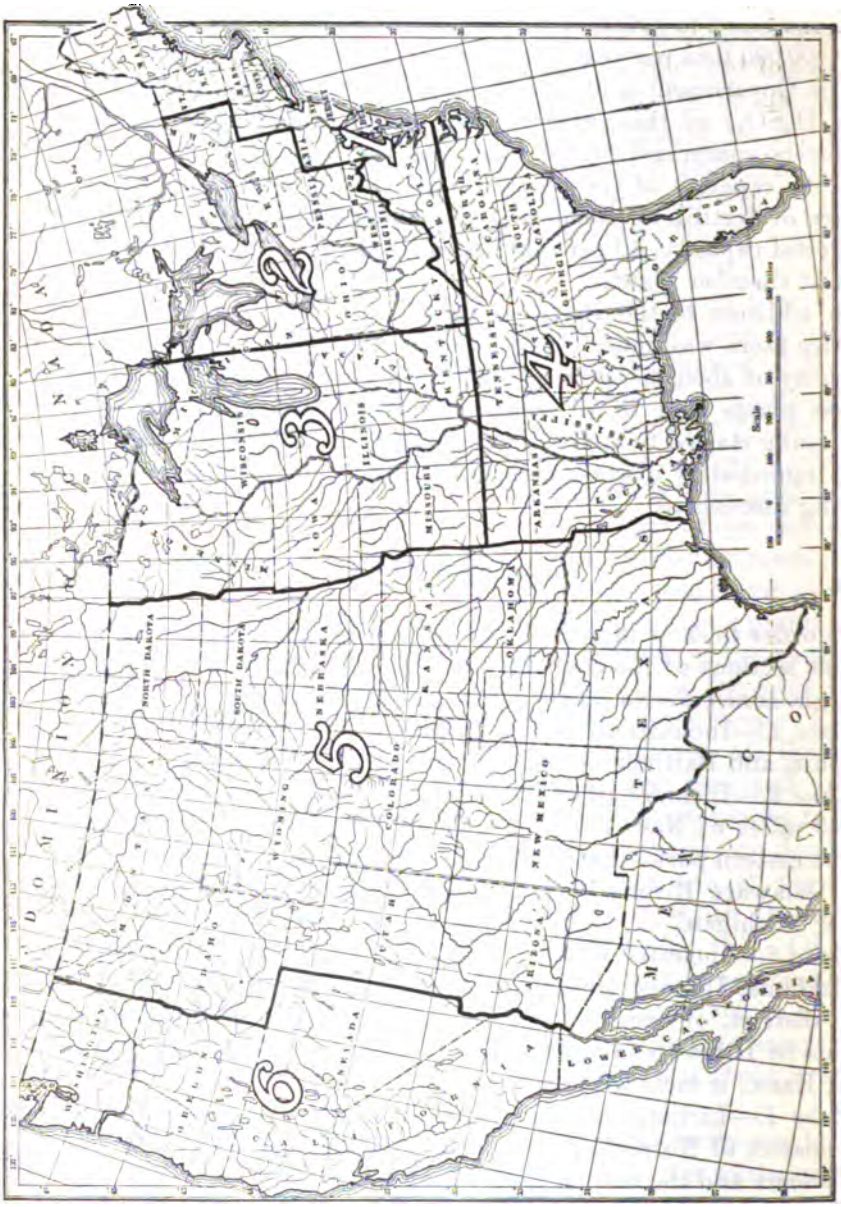

FIGURE 1.—Zones of sulphuric acid manufacture in the United States.

mercial concerns in Chicago and St. Louis. The production in zone 4 is essentially for the fertilizer industry. That of zone 6 is essentially for the oil refining and explosives manufacturing industries of California, although some of the weak acid is used for fertilizers. These features will be shown in more detail later, as the uses of the sulphuric acid are discussed.

The capacities in these several zones in November, 1918, are given below:

Sulphuric acid manufacturing capacities.

Zone.	Total capacity.		Percentage of total acid capacity.
	Tons per month, expressed as 100 per cent H_2SO_4.	Tons per year, expressed as 50° B. acid.	
1	191,000	3,665,000	38.0
2	85,300	1,630,000	17.4
3	65,200	1,260,000	13.0
4	114,000	2,190,000	22.6
5	23,350	448,000	4.6
6	22,150	425,000	4.4
Total	501,000	9,618,000	100.0

The contact acid capacity was distributed as follows:

Capacities of contact acid plants.

Zone.	Capacity, tons per month, as 100 per cent H_2SO_4.	Percentage of total contact capacity.
1	82,440	41.2
2	36,700	18.3
3	27,100	13.5
4	30,000	15.0
5	5,300	2.6
6	18,850	9.4
Total	200,390	100.0

The chamber capacity was distributed as follows:

Capacity of chamber plants.

Zone.	Tons per month, expressed as 50° B. acid.	Percentage of total.
1	175,000	36.4
2	77,200	16.0
3	61,000	12.6
4	134,500	27.9
5	28,800	6.0
6	5,300	1.1
Total	481,800	100.0

The total capacity was divided between (1) Government plants, (2) plants owned by munitions explosives companies, and (3) commercial, fertilizer, and by-product acid plants in the second zone, as follows:

Acid-manufacturing capacity by types of ownership.

[Tons per month expressed as 100 per cent H_2SO_4.]

Zone.	At government plants.	At explosives companies plants.	At commercial-acid manufacturers' plants.
1	3,800	40,800	146,400
2	21,200		64,200
3		9,200	56,000
4	30,000		84,000
5		660	22,600
6		7,350	14,800
Total	55,000	58,030	338,000

The actual production of acid during the year 1918 was 4,650,000 tons on the basis 100 per cent H_2SO_4, or 7,450,000 tons on the basis 50° B. In October the rate of production had increased to 430,000 tons per month (basis 100 per cent H_2SO_4), or 8,250,000 tons per year (basis 50° B.). The production of high-strength acid—that is, 66° acid or higher—was 2,430,000 tons (basis 100 per cent H_2SO_4). In October the rate of production was 230,000 tons per month, or 2,760,000 tons per year (basis 100 per cent H_2SO_4). During 1918 the average rate of production of the plants was not greater than 90 per cent of the rated capacities, although many plants were actually operating at above their rated capacities. Adverse fuel, labor, and transportation conditions during the greater part of the year tended to reduce production at many plants in the East and North.

LIST OF PLANTS.

The plants in the different zones are listed in the following table:

List of sulphuric acid plants in United States, Jan. 1, 1919.

DISTRICT 1.

Company.	Locality of plant.		Character of plant.
	Town.	State.	
Naugatuck Chemical Co	Naugatuck	Connecticut	Chamber.
Franklin Kalbfleisch Corporation	Waterbury	do	Do.
General Chemical Co	Claymont	Delaware	Contact.
American Agricultural Chemical Co	Baltimore	Maryland	Chamber (3 plants).
Baugh Chemical Co	do	do	Chamber.
Standard Acid Works	do	do	Do.
F. S. Royster Guano Co	do	do	Do.
Virginia-Carolina Chemical Co	do	do	Do.

List of sulphuric acid plants in United States, Jan. 1, 1919—Continued.

Company.	Locality of plant.		Character of plant.
	Town.	State.	
Griffith-Boyd Co	Baltimore	Maryland	Chamber.
Davison Chemical Co	do	do	Do.
Scott Fertilizer Co	Elkton	do	Do.
Naval Proving Grounds	Indianhead	do	Contact.
Lancaster Chemical Co	Perryville	do	Chamber.
Lowell Fertilizer Co	Boston	Massachusetts	Do.
Merrimac Chemical Co	Everett	do	Chamber and contact
Butterworth Judson Corporation	Medford	do	Chamber.
American Agricultural Chemical Co	North Weymouth.	do	Do.
Avery Chemical Co	Tewksbury	do	Do.
Merrimac Chemical Co	Woburn	do	Chamber and contact.
General Chemical Co	Bayonne	New Jersey	Contact.
Standard Oil Co	do	do	Chamber and contact.
Calco Chemical Co	Boundbrook	do	Contact.
King Chemical Co	do	do	Chamber.
General Chemical Co	Camden	do	Contact.
American Agricultural Chemical Co	Carteret	do	Chamber.
Do	Chrome	do	Do.
Armour Fertilizer Works	do	do	Do.
Franklin Kalbfleisch Corporation	Elizabeth	do	Do.
American Agricultural Chemical Co	Elizabethport	do	Do.
General Chemical Co	Edgewater	do	Do.
E. I. du Pont de Nemours & Co	Deepwater Point	do	Do.
Do	Gibbstown	do	Do.
Grasselli Chemical Co	Grasselli	do	Chamber and contact
Mutual Chemical Co	Jersey City	do	Chamber.
Hercules Powder Co	Kenville	do	Contact.
American Smelting & Refining Co	Maurer	do	Chamber.
Butterworth Judson Corporation	Newark	do	Do.
Do	do	do	Contact.
Harrison Bros. (Inc.)	do	do	Do.
Do	Paulsboro	do	Do.
E. I. du Pont de Nemours & Co	Pennsgrove	do	Contact.
American Cyanamid Co	Warners	do	Chamber.
Atlas Powder Co	Hopatcong	do	Contact.
Franklin Kalbfleisch Corporation	Brooklyn	New York	Chamber.
Robinson Bros	do	do	Do.
General Chemical Co	Laurel Hill	do	Contact.
Trojan Chemical Co	Allentown	Pennsylvania	Chamber.
Chas. Lennig & Co	Bridesburg	do	Do.
Harrison Bros	Philadelphia	do	Do.
Do	do	do	Contact.
I. P. Thomas & Sons	do	do	Chamber.
Pennsylvania Salt Manufacturing Co	do	do	Do.
Powers-Weighton-Rosengarten Co	do	do	Do.
United Gas Improvement Co	Point Breeze	do	Do.
New Jersey Zinc Co	Palmerton	do	Contact.
Atlas Powder Co	Tamaqua	do	Do.
York Chemical Co	York	do	Chamber.
American Agricultural Chemical Co	Alexandria	Virginia	Do.
E. I. du Pont de Nemours & Co	Hopewell	do	Contact.
Virginia-Carolina Chemical Co	Lynchburg	do	Chamber.
Robertson Fertilizer Co	Norfolk	do	Do.
F. S. Royster Guano Co	do	do	Do.
General Chemical Co	Pulaski	do	Contact.
Virginia-Carolina Chemical Co	Pinners Point	do	Chamber.
Do	Richmond	do	Do.
Do	do	do	Do.
Richmond Guano Co	do	do	Do.

DISTRICT 2.

American Agricultural Chemical Co	Buffalo	New York	Chamber.
Contact Process Co	do	do	Chamber and contact.
General Chemical Co	do	do	Contact.
Titanium-Alloy Manufacturing Co	Niagara Falls	do	Do.
Eastman Kodak Co	Rochester	do	Do.
Grasselli Chemical Co	Canton	Ohio	Chamber.
Do	Cleveland	do	Do.

List of sulphuric acid plants in United States, Jan. 1, 1919—**Continued.**

Company.	Locality of plant.		Character of plant.
	Town.	State.	
General Chemical Co	Cleveland	Ohio	Contact.
American Agricultural Chemical Co	do	do	Chamber.
Do	Cincinnati	do	Do.
Jarecki Chemical Co	do	do	Do.
Virginia-Carolina Chemical Co	do	do	Do.
Farmers' Fertilizer Co	Columbus	do	Do.
Smith Agricultural Chemical Co	do	do	Do.
Grasselli Chemical Co	Lockland	do	Do.
Do	Niles	do	Do.
New Jersey Zinc Co	Tiltonville	do	Contact.
St. Bernard Acid Works	St. Bernard	do	Chamber.
Virginia-Carolina Chemical Co	Sandusky	do	Do.
American Alkali & Acid Co	Bradford	Pennsylvania	Do.
Grasselli Chemical Co	Beaver Falls	do	Do.
American Steel & Wire Co	Donora	do	Do.
F. H. Kalbfleisch Corporation	Erie	do	Do.
American Zinc & Chemical Co	Langeloth	do	Do.
Pennsylvania Salt Manufacturing Co	Natrona	do	Chamber and contact.
Grasselli Chemical Co	Newcastle	do	Chamber.
General Chemical Co	Newell	do	Contact.
American Sheet Tin & Plate Co	Vandergrift	do	Chamber.
Riverside Acid Works	Warren	do	Do.
Fairmount Chemical Co	Fairmount	Virginia	Do.
United Zinc Smelting Corporation	Moundsville	West Virginia	Do.
United States Government Smokeless Powder Plant.	Nitro	do	Contact.

DISTRICT 3.

Hegeler Zinc Co	Danville	Illinois	Chamber.
New Jersey Zinc Co	Depue	do	Contact.
Victor Chemical Co	Chicago Heights	do	Chamber.
Commercial Acid Co	East St. Louis	do	Do.
Do	do	do	Contact.
American Zinc, Lead & Smelting Co	do	do	Chamber.
Do	Hillsboro	do	Do.
Robert Lanyon Zinc & Acid Co	do	do	Do.
Matthiessen & Hegeler Zinc Co	LaSalle	do	Do.
Illinois Zinc Co	Peru	do	Do.
General Chemical Co	South Chicago	do	Contact.
Central Chemical Co	West Hammond	do	Chamber.
Grasselli Chemical Co	Grasselli	Indiana	Do.
Do	do	do	Contact.
E. Rauh & Sons Fertilizer Co	Indianapolis	do	Chamber.
Detroit Chemical Co	Detroit	Michigan	Do.
Cleveland Cliffs Iron Co	Marquette	do	Do.
Atlas Powder Co	Atlas	Missouri	Contact.
New Jersey Zinc Co	Mineral Point	Wisconsin	Do.
E. I. duPont de Nemours & Co	Barksdale	do	Do.
Vinegar Hill Mining Co	Platteville[a]	do	Do.
Wisconsin Zinc Co	New Diggings[a]	do	Do.

[a] Not completed.

DISTRICT 4.

Jefferson Fertilizer Co	Bessemer	Alabama	Chamber.
Grasselli Chemical Co	Birmingham	do	Do.
Virginia-Carolina Chemical Co	do	do	Do.
Do	Dothan	do	Do.
Home Guano Co	do	do	Do.
Virginia-Carolina Chemical Co	Mobile	do	Do.
Alabama Chemical Co	Montgomery	do	Do.
American Agricultural Chemical Co	do	do	Do.
Virginia-Carolina Chemical Co	Opelika	do	Do.
Roanoke Guano Co	Roanoke	do	Do.
Virginia-Carolina Chemical Co	Selma	do	Do.
Planters' Chemical & Oil Co	Talladega	do	Do.
Standard Chemical & Oil Co	Troy	do	Do.

List of sulphuric acid plants in United States, Jan. 1, 1919—Continued.

Company.	Locality of plant.		Character of plant.
	Town.	State.	
Southern Sulphur Oil Co	Albany	Georgia	Chamber.
Empire State Chemical Co	Athens	do	Do.
Armour Fertilizer Co	Atlanta	do	Do.
Morris Fertilizer Co	do	do	Do.
Swift Fertilizer Co	do	do	Do.
Virginia-Carolina Chemical Co	do	do	Do.
Do	Augusta	do	Do.
Southern States Phosphate & Fertilizer Co.	do	do	Do.
Blackshear Manufacturing Co	Blackshear	do	Do.
Mandeville Mills	Carrollton	do	Do.
Home Mixture Guano Co	Columbus	do	Do.
Southern Sulphur Ore Co	do	do	Do.
Virginia-Carolina Chemical Co	do	do	Do.
Furman Farm Improvement Co	East Point	do	Do.
Troup Co	Lagrange	do	Do.
Cotton States Feed & Fertilizer Co	Macon	do	Do.
F. S. Royster Guano Co	do	do	Do.
McCabe Chemical Co	do	do	Do.
Virginia-Carolina Chemical Co	do	do	Do.
Do	Rome	do	Do.
Pelham Phosphate Co	Pelham	do	Do.
American Agricultural Chemical Co	Savannah	do	Do.
Mutual Fertilizer Co	do	do	Do.
Phosphate Mining Co	do	do	Do.
The Reliance Fertilizer Co	do	do	Do.
Savannah Guano Co	do	do	Do.
Southern Fertilizer & Chemical Co	do	do	Do.
Virginia-Carolina Chemical Co	do	do	Do.
Georgia Fertilizer & Oil Co	Valdosta	do	Do.
Barker Chemical Co	Dunnellton	Florida	Do.
Armour Fertilizer Works	Jacksonville	do	Do.
Wilson & Toomer Fertilizer Co	do	do	Do.
American Agricultural Chemical Co	Pensacola	do	Do.
E. O. Painter Fertilizer Co	Jacksonville	do	Do.
Union Seed & Fertilizer Co	Gretna	Louisiana	Do.
Planters Fertilizer & Chemical Co	New Orleans	do	Do.
Virginia-Carolina Chemical Co	Shreveport	do	Do.
Swift & Co	New Orleans	do	Do.
Gulfport Fertilizer Co	Gulfport	Mississippi	Do.
Meridian Fertilizer Factory	Hattiesburg	do	Do.
Do	Meridian	do	Do.
Jackson Fertilizer Co	Jackson	do	Do.
Tupelo Fertilizer Co	Tupelo	do	Do.
Acme Manufacturing Co	Acme	North Carolina	Do.
McCabe Chemical Co	Charlotte	do	Do.
Virginia-Carolina Chemical Co	do	do	Do.
Do	Durham	do	Do.
Do	Selma	do	Do.
Do	Wadesboro	do	Do.
Virginia-Carolina Chemical Co. (Almont works).	Wilmington	do	Do.
Virginia-Carolina Chemical Co. (Navassa works).	do	do	Do.
Virginia-Carolina Chemical Co	Winston-Salem	do	Do.
Caraleigh Phosphate & Fertilizer Works	Raleigh	do	Do.
American Agricultural Chemical Co	Wilmington	do	Do.
Swift Fertilizer Works	do	do	Do.
Anderson Phosphate & Oil Co	Anderson	South Carolina	Do.
Virginia-Carolina Chemical Co	Blacksburg	do	Do.
Do	do	do	Do.
Virginia-Carolina Chemical Co. (Standard works).	do	do	Do.
Virginia-Carolina Chemical Co	Greenville	do	Do.
Do	Pon Pon	do	Do.
Virginia-Carolina Chemical Co. (A. C. Stone).	Charleston	do	Do.
American Agricultural Chemical Co	Columbia	do	Do.
Do	Charleston	do	Do.
Etiwam Fertilizer Co	do	do	Do.

List of sulphuric acid plants in United States, Jan. 1, 1919—Continued.

Company.	Locality of plant.		Character of plant.
	Town.	State.	
Maybank Fertilizer Co.	Charleston	South Carolina	Chamber.
McCabe Chemical Co.	do.	do.	Do.
Planters Fertilizer & Phosphate Co.	do.	do.	Do.
Read Phosphate Co.	do.	do.	Do.
Royster Guano Co.	Columbia	do.	Do.
Tennessee Copper Co.	Copperhill	Tennessee	Do.
Ducktown Sulphur, Copper & Iron Co.	Isabella	do.	Do.
Virginia-Carolina Chemical Co.	Memphis	do.	Do.
Armour Fertilizer Works	Nashville	do.	Do.
Federal Chemical Co.	do.	do.	Do.
Read Phosphate Co.	do.	do.	Do.
U. S. Government Smokeless Powder Plant.	do.	do.	Contact.
DISTRICT 5.			
Commercial Acid Co.	Augusta	Arkansas	Chamber.
Arkansas Fertilizer Co.	Little Rock	do.	Do.
Ellory Davis Corp. (U. S. Government)	do.	do.	Do.
Calumet & Arizona Mining Co.	Douglas	Arizona	Do.
Western Chemical Manufacturing Co.	Denver	Colorado	Do.
Do.	do.	do.	Contact.
E. I. duPont de Nemours Co.	Louviers	do.	Do.
National Zinc Co.	Argentine	Kansas	Chamber.
Anaconda Copper Mining Co.	Anaconda	Montana	Do.
E. I. du Pont de Nemours & Co.	Ramsay	do.	Contact.
Mid Continental Chemical Co.	Sand Springs	Oklahoma	Chamber.
Armour Fertilizer Works	Houston	Texas	Do.
Gulf Refining Co.	Port Arthur	do.	Contact.
Commercial Acid Co.	do.	do.	Do.
Sugarland Manufacturing Co.	Sugarland	do.	Chamber.
Hercules Powder Co.	Bacchus	Utah	Contact.
Garfield Chemical Manufacturing Co.	Garfield	do.	Chamber
DISTRICT 6.			
General Chemical Co. of California	Bay Point	California	Contact.
American Agricultural Chemical Co.	Los Angeles	do.	Chamber.
Mountain Copper Co. (Ltd.)	Martinez	do.	Do.
Barbour Chemical Works	Melrose	do.	Do.
Hercules Powder Co.	Pinole	do.	Contact.
Standard Oil Co. of California	Richmond	do.	Do.
Stauffer Chemical Co.	San Francisco	do.	Chamber.
Pacific Guano & Fertilizer Co.	Stege	do.	Do.
E. I. du Pont de Nemours Co.	Du Pont	Washington	Contact.

CAPACITY OF COMMERCIAL, FERTILIZER, AND BY-PRODUCT PLANTS, JANUARY 1, 1919.

Within a short period after the signing of the armistice the Government plants and many of the munitions explosives companies' plants—that is, plants making acid solely for war munitions—stopped work. All of the commercial and by-product plants that had been using brimstone to supplement their production from pyrite or zinc ores ceased doing so and returned to the normal methods of operation.

If the Government plants be eliminated and those plants built by explosives companies between 1915 and 1918, which will not continue to be operated, the situation as regards potential capacity on January 1, 1919, was about as follows:

Capacity of commercial fertilizer and by-product plants, January 1, 1919.

[Tons per month.]

Zone.	Chamber plants (as 50° B.).	Contact plants (as 100 per cent H_2SO_4).	Total (as 100 per cent H_2SO_4).
1	164,000	44,800	147,300
2	77,000	15,300	63,400
3	61,000	19,000	57,100
4	134,000	....	83,700
5	29,000	4,700	22,800
6	5,000	11,000	14,100
Total	470,000	94,800	388,400

USES OF SULPHURIC ACID.

Sulphuric acid is used in the chemical and metallurgical industries of this country in so many ways that the compilation of a complete list of its uses would be a difficult task. Therefore, only the more important uses are given in the following résumé:

1. Dilute acid—that is, 60° B. (78 per cent H_2SO_4) acid, or weaker—is used in the manufacture of superphosphates, ammonium sulphate, and sulphates of metals (magnesium, aluminum, iron, zinc, copper); in precipitating barium and calcium sulphate for chemical purposes; in the manufacture of mineral acids (nitric, hydrochloric, boric, carbonic, and chromic) and various organic acids (oxalic, tartaric, citric, acetic, and stearic); in pickling sheet iron for tinning and galvanizing; in various metallurgical operations; in the production of copper, zinc, nickel, silver, and gold; for various types of galvanic batteries, storage batteries, electroplating; in the manufacture of ether; in making and purifying many organic coloring matters; in making starch, sirup, and sugar; and in innumerable other chemical and industrial operations.

2. Concentrated acid—that is, acid 60° B. (78 per cent H_2SO_4) to 100 per cent H_2SO_4—is used for purifying benzene, petroleum, paraffin oil, and other mineral oils; for manufacture of nitroglycerin, pyroxylin, nitrobenzene, picric acid, and various other nitric compounds and nitro ethers; and in the manufacture of the fatty acids by distillation.

3. Fuming acid (oleum) is used principally for the manufacture of various forms of explosives, as nitrocellulose, trinitrotoluol, picric

acid, nitroglycerin; manufacture of certain organo sulphuric acids; and for fortifying weaker acids.

Of all the uses, the following take the greatest tonnage of acid: (1) Manufacture of phosphate fertilizer; (2) refining of petroleum products; (3) pickling of iron and steel; (4) manufacture of nitrocellulose, nitroglycerin, celluloid, etc.; (5) general chemical and metallurgical operations.

DISTRIBUTION OF ACID IN THE INDUSTRIES.

During June, July, and August, 1918, a comprehensive study of the uses of sulphuric acid in the various industries was undertaken by the Bureau of Mines. Data on the contracts of the acid manufacturers with the consumers, shipments to consumers, and the amounts used for various purposes by the manufacturers themselves during that period were obtained. With this information, covering the consumption of the 390,000 tons of acid (basis 100 per cent H_2SO_4), and the average consumption per month during these months, the data shown in Table 1 were tabulated. The table gives the distribution of acid to various uses for the whole country during the period June to August, 1918.

TABLE 1.—*Distribution of sulphuric acid in the industries, summer of 1918.*

Industry.	Acid used, tons per month (reduced to basis of 100 per cent H_2SO_4).	Tons per year (reduced to 50° B. basis).	Percentage of total acid used.
1. Explosives (military and domestic)	140,000	2,700,000	36.0
2. Fertilizers	111,000	2,130,000	28.4
3. Oil refineries	35,000	671,000	8.8
4. Chemicals, drugs, and ammonium sulphate	38,500	740,000	9.9
5. Steel pickling and galvanizing	36,500	700,000	9.3
6. Fabrics, textiles, etc	5,200	100,000	1.3
7. Paints, lithopone, glue, etc	5,300	104,000	1.4
8. Metallurgical, including storage batteries	15,200	292,000	3.9
9. Miscellaneous	3,800	73,000	1.0
Total	390,500	7,510,000	100.0

This table shows, eliminating the acid used for munitions and explosives, and allowing about 10,000 tons per month for domestic explosives, an indicated requirement for normal peace industries of possibly 260,000 tons per month (basis, 100 per cent H_2SO_4), or about 5,000,000 tons per year (basis, 50° B.).

Prior to the war the consumption of acid for phosphate fertilizer was about 2,300,000 tons (basis, 50° B.). Up to June, 1919, the consumption of acid for phosphate fertilizers has been more than 2,500,000 tons, or more than 50 per cent of the total production, and the consumption is without doubt going to increase year by year. Not only is the use of phosphate fertilizer still increasing in the South, but it is beginning to be an important factor west of the Mississippi River. The gradual increase in consumption of phosphate fertilizers in the Middle West and western States will bring into existence acid and phosphate-fertilizer plants in connection with the smelters in Montana and Utah, where much waste gas is available.

The smelters in Montana and Utah should be in position to make phosphate fertilizer for the western markets—that is, west of the Mississippi River and north of St. Louis. In southeastern Idaho, northeastern Utah, and southwestern Wyoming there is plenty of high-grade phosphate rock which can be mined at a comparatively low cost. The freight rate on acid phosphate rock or phosphate fertilizer to the district in question should be no greater from Montana or Utah than from possible southern or eastern producing points, so that no freight-rate handicap will exist. As a matter of fact, freight rates will be such a large item in the cost of the phosphate fertilizer in this district that it will probably be desirable to manufacture and ship into this district a high-grade material that can be diluted again at the point of consumption if necessary. One of the western smelters is now planning to enter this district with a high-grade product, and it is believed that such an industry will ultimately grow to enormous proportions.

The acid being used for fertilizers is nearly all chamber acid. In the South at most plants the plant for acidulating the phosphate rock is in close proximity to or is a part of the acid plant, and little transportation of acid is involved, the acid being pumped directly from the chambers or storage tank to the acidulating tank. When acid is shipped to the fertilizer plant it is usually shipped as 60° B. acid.

Approximately 1 ton of acid (50° B. basis) is required to treat 1 ton of phosphate rock to produce the ordinary superphosphate.

The acid used for refining petroleum is practically all 66° B. acid. Weaker acid is not satisfactory as it will not enter into the reactions involved in decolorizing and deodorizing of the oils by removal of part of the unsaturated hydrocarbons. In a few instances where weaker acid might possibly be used, so much more of it would be required to obtain the results obtainable with the 66° acid that its use is not economical. In petroleum refining, fuming sulphuric acid is used exceptionally; its principal and practically only use is by certain eastern oil refineries in the preparation of colorless and odorless oil (nujol). When fuming acid is used, sulphonates are obtained. known as "Twitchell's reagent."

The amount of acid used per gallon of refined product varies primarily with the character of the crude oil and also with the refining methods employed. In the manufacture of gasoline, the general consumption varies between 0.04 and 0.15 pound of acid (gravity, 66° B.) per gallon, with an average of perhaps 0.10 pound. For refined oils, such as kerosene and illuminating oils, the consumption is between 0.06 and 0.20 pound of acid per gallon, with an average of about 0.12. In the manufacture of lubricating oils, the consumption varies from 0.08 to 0.80 pound per gallon; the average is difficult to estimate, being perhaps 0.40 pound of acid per gallon of oil.

Approximate average figures for the distribution of the acid consumer by refiners among gasoline, kerosene, and lubricating oils throughout the United States, as estimated by the petroleum division of the Bureau of Mines, are as follows: Gasoline, 35 per cent; kerosene, 25 per cent; and lubricating oils, 40 per cent.

The figures for the large and complete eastern refineries are probably more like the following: Gasoline, 20 per cent; kerosene, 20 per cent; lubricating oils, 60 per cent.

In the manufacture of explosives, sulphuric acid is used for two purposes: (1) For the production of nitric acid or mixed acids used in nitrating the organic bodies—that is, cellulose, toluol, phenol, etc.—and (2) as a rehydrating agent. For nitrating purposes 66° B. acid is usually used, but stronger acids are required for dehydrating purposes. The consumption of acid in domestic commercial explosives is about 1.6 pounds of acid per pound of nitroglycerin contained therein. The estimated consumption in manufacturing domestic explosives is about 7,500 tons of acid per month (basis, 100 per cent H_2SO_4). In the manufacture of military explosives the net consumption of acid varies greatly, according to the efficiency of operation of the plant and the amount of acid recovered. From data obtained during 1918 the average consumption of acid at the explosives plants in this country was as follows:

Consumption of acid at explosives plants.

	Pounds of acid (basis, 100 per cent H_2SO_4) per pound of product.
For manufacturing smokeless powder from cotton linter	2.3
for manufacturing T N T from toluol	2.2
For manufacturing picric acid from benzol	6.5

With the gradual elimination of the beehive coke oven by the substitution of the by-product coke plant, there will be more and more ammonia available for the production of ammonium sulphate fertilizer, and this will require more and more sulphuric acid. This requirement may reach a monthly consumption figure of 15,000 tons of acid (basis, 100 per cent H_2SO_4).

For the pickling of steel for tinning and galvanizing purposes, the consumption is approximately 30,000 to 35,000 tons per month (basis, 100 per cent H_2SO_4) when the production of the plate and galvanized ware is heavy. This acid is usually shipped to the pickling plant as 60° acid.

The consumption of sulphuric acid for metallurgical purposes, in connection with the treatment of copper and zinc ores, has increased greatly in the West during the last few years. Part of the acid is used in the flotation of copper, lead, and zinc minerals from their ores. Also a large amount is used in leaching ores and waste tailings for recovery of the copper or zinc content.

The acid made by the Calumet & Arizona Mining Co. is practically all used for leaching carbonate copper ores at Ajo, Ariz. The Anaconda Copper Mining Co. has been producing acid for leaching mill tailings and for leaching zinc ores, as well as supplying acid for the flotation process. The Garfield Chemical Mfg. Co. has been producing acid for leaching low-grade ores from the Utah Copper Co.

The use of acid in certain of these industries has been greatly curtailed in the last year, but will probably be resumed on a large scale in the future. It is believed that the normal requirement of acid in this country in the future will be not less than 270,000 to 300,000 tons per month (basis, 100 per cent H_2SO_4) or about 5,500,000 tons per year (basis, 50° B.).

Although the majority of the manufacturing trades are dependent on supplies of sulphuric acid, yet in comparatively few trades is the cost of the acid an important factor, because the charge for the acid in relation to the total cost of the manufactured goods is often small or even negligible. This applies especially to the textile trades, to leather, paints, etc. In the manufacture of phosphate fertilizers the cost of the acid is a relatively high proportion of the total cost of production. In order to meet the keen competition in the industrial fields efficient working and low cost of production are essential, but the cost becomes a problem of even greater importance in the manufacture of phosphate fertilizers.

Sulphuric acid is a low-priced commodity, but its transportation over long distances is difficult and expensive. Thus the cost of production of acid, which is discussed later, can not be dissociated from the question of the locality of the acid works, because ultimately the cost of the acid as delivered is the deciding factor. The real importance of the cost of any commodity is the cost to the consumer at the point of consumption and not at the producer's works. Thus, although acid may be produced very cheaply as a by-product at smelters in the West, where the raw material (sulphur gases) may be obtained at little or no cost to the acid plant, yet because of the great distance to points of consumption this by-product acid can not compete in eastern markets with acid manufacturers in the East, even though the eastern plants must use expensive raw material.

An acid plant illy situated as to markets or with a capacity much greater than is required for the demand within a comparatively small radius can rarely overcome its haulage handicap by efficient operation. Prior to the war little acid was hauled far in the eastern part of this country. A 200-mile haul for a regular contract delivery of acid over a long period of time was exceptional, for it usually paid the acid manufacturer to build a plant closer to the point of consumption, assuming, of course, the tonnage involved warranted the erection of a plant. During the war this condition was greatly disturbed, especially as regard the haulage of high-strength acid. In the period of exceptionally high prices acid was even shipped from the Pacific coast to New York, from Colorado to Pittsburgh and other points in Pennsylvania, and from the South to the North. With a resumption of normal business conditions, however, such hauls could not continue. Acid is now hauled comparatively short distances, and with the higher freight rates now involved the tendency toward shorter hauls will be even stronger than it has been in the past.

RAW MATERIALS USED IN MANUFACTURE OF SULPHURIC ACID.

TYPES OF MATERIALS USED.

The sulphur-bearing raw materials from which sulphuric acid is made in this country are as follows:

(1) Brimstone.
(2) Pyrite ores:
    (*a*) Spanish pyrite—cuperous and noncupreous.
    (*b*) Domestic pyrite,
    (*c*) Canadian pyrite,
    (*d*) Pyrite from coal waste.
(3) Pyrrhotite.
(4) Zinc ores—crude ores and concentrates.
(5) Waste sulphur dioxide gases from copper smelting.
(6) Spent oxide from gas works.

GENERAL DISCUSSION OF MATERIALS USED.

During the early years of the sulphuric acid industry, brimstone was practically the only sulphur-bearing raw material used. In 1882, 85 per cent of the acid produced in this country was made from brimstone, and in 1895 about 75 per cent. From that time on pyrite began to be used more and more, resulting, by 1900, in the almost complete elimination of brimstone for acid manufacture, except in special cases. The production of acid as a by-product in the smelting of zinc ores began in 1895, at a plant at La Salle, Ill., and the practice has become almost general in the last 20 years at the zinc plants in the Illinois field. In 1907 the practice of manufacturing acid from the waste gases of a copper-blast furnace was inaugurated. The use of pyrrhotite was first successfully demonstrated only about 12 years ago.

In 1914 the acid production of the country was obtained from the following sources, in approximately the following amounts:

Amounts of acid produced in United States from different sources, 1914.

	Tons of 50° B. acid.	Percentage of-total.
From brimstone (approximately)	100,000	2.6
From pyrite:		
Spanish pyrite	1,900,000	50.0
Domestic pyrite, including "coal brasses" and pyrrhotite	600,000	15.8
Canadian pyrite	300,000	7.9
From roasting zinc ores	500,000	13.2
From waste gases at copper smelters	400,000	10.5
Total	3,800,000	100.0

During the rapid expansion of the acid industry between 1915 and 1918 many of the new plants were built to utilize brimstone alone. In 1917 the use of brimstone was still further augmented by the partial curtailment of the importation of Spanish pyrite, brimstone being substituted for pyrite at many plants. Also many plants burned some brimstone to supplement production from sulphur-bearing ores, especially plants making acid from zinc ores.

In 1917 the acid was produced from the following raw materials, approximately as below:

Amounts of acid produced in United States from different sources, 1917.

	Tons of 50° B. acid.	Percentage of total.
From brimstone	2,350,000	32.6
From pyrite:		
Spanish	1,650,000	22.9
Domestic, including "coal brasses" and pyrrhotite	850,000	11.8
Canadian	500,000	6.9
From roasting zinc ore	1,300,000	18.1
From waste gases at copper smelters	550,000	7.7
Total	7,200,000	100.0

In 1918, the further curtailment of the Spanish imports necessitated an even greater substitution of brimstone at plants which formerly had been burning pyrite, as shown in the following table.

The acid production in 1918 was obtained, approximately, as follows:

Amounts of acid produced in United States from different sources, 1918.

	Tons of 50° B. acid.	Percentage of total.
From brimstone	3,580,000	48.0
From pyrite:		
Spanish pyrite	570,000	7.6
Domestic pyrite, including "coal brasses" and pyrrhotite	950,000	12.7
Canadian pyrite	550,000	7.5
From roasting zinc ores	1,200,000	16.1
From waste gases at copper smelters	600,000	8.1
Total	7,450,000	100.0

With the end of the war, the use of brimstone to supplement other material ceased almost immediately. Several brimstone-burning plants were shut down completely, and at all plants manufacturers began to curtail production. During the spring of 1919 brimstone stocks at acid plants were being gradually used up, and acid manufacturers were inclined not to replenish their stocks until it was apparent that brimstone could be purchased on a parity basis with pyrite ores, the importation of which was gradually resumed.

Whether or not brimstone is largely retained by the acid industry as the raw material of the future or whether there will be a general resumption of the use of pyrite, will depend, of course, upon the relative price of the two kinds of material.

During the war it was necessary at one time to endeavor to establish figures for the relative values to the consumers of sulphur per unit as brimstone or pyrite for the purpose of acid making.

Allowing for the cost of handling each material, the disposal of the cinder from the pyrite. the cleanliness of the gases from the brimstone burners, as compared with the gases from pyrite burners, and all other factors which would affect the cost of manufacture, it was estimated that as a rule if the consumer of pyrite received nothing for the cinder, the brimstone was worth about 3 to 4 cents per unit (a unit equals 1 per cent or 1 unit in a long ton equals 22.4 pounds) more, for acid manufacturing purposes, than sulphur in pure pyrite carrying 40 to 43 per cent sulphur. At certain plants where especially favorable facilities were installed for handling pyrite, the differential would be slightly less. At other plants, especially plants equipped for handling lump material, the differential might be somewhat greater. If copper was present in amounts which made its recovery advisable, this must also be considered. If there was a market for the cinder as iron ore, this factor, too, must be taken into consideration.

The following illustration shows the comparison in the cost of burning 10 tons of sulphur per day from 45 per cent pyrite fines and from brimstone. The pyrite is assumed to cost 15 cents per unit, or $6.75 per ton, and the brimstone to cost 18.5 cents per unit, or $18.50 per ton, both delivered at the acid plant. The amount of pyrite required per 10 tons of sulphur available is 23.3 tons. The costs for roasting and depreciation are average figures taken from the actual operating data for a number of plants in 1917:

Costs of burning 10 tons of sulphur from pyrite and from brimstone.

	Cost from burning pyrite.
Material, 23.3 tons, at $6.75 per ton	$157.25
Handling and roasting ore, 23.3 tons, at $1.10 per ton	25.65
Handling cinder, 17.5 tons, at 25 cents per ton	4.37
Repairs to and depreciation of burner plant (10 per cent)	6.00
Total	193.27
	Cost from burning brimstone.
Material, 10.1 tons, at $18.50 per ton	$187.00
Handling and burning, at 60 cents per ton	6.06
Repairs to and depreciation of burner plant (10 per cent)	1.00
Total	194.06

If the pyrite and brimstone were purchased f. o. b. the shipper's point, and freight charges are thereby involved, there would be an even greater differential than that indicated.

In the preceding example, if the consumer could obtain $1.50 per ton for the cinder, he could afford to pay 17.5 cents per unit for the pyrite as against 18½ cents per unit for the brimstone.

These figures in this example are given as an average illustration. The exact differential applicable to any plant will depend on the conditions at the acid plant. At some plants where the roasting equipment has already been amortized, the differential will be less than that given. With an ore containing only 40 or 35 per cent sulphur, the differential will be even greater.

The sources of supply and the character of each of the several types of sulphur-bearing material is discussed in the following paragraphs:

BRIMSTONE.

Native sulphur or brimstone occurs in many parts of the world, generally either in beds of gypsum and associated rocks, or in the region of active and extinct volcanoes. Deposits of sulphur are found in two places in Sicily, and at several places on the mainland of Italy, in considerable quantities. Sulphur is also found in Japan, Iceland, Mexico, in the Chilean Andes, South America, China, India, and the Philippine Islands. In this country volcanic sulphur is found in the vicinity of numerous hot springs in Wyoming, Idaho, Utah, Nevada, and California. The principal sources of sulphur in this country are the large deposits of natural sulphur, associated with beds of gypsum, in the coastal plains of the Gulf of Mexico.

SICILIAN BRIMSTONE.

Until the year 1903 the greater part of the world's supply of brimstone was mined and prepared for use in Sicily and Italy, about 85 per cent being obtained from Sicily; Japan produced a very small amount. Until the introduction of Louisiana sulphur, extracted by the Frasch process, Sicily controlled the sulphur industry of the world.

The Sicilian mines are distributed over an area of about 100 miles by about 55 miles. The deposits vary in depth from 150 to 650 feet. The brimstone varies considerably in its total sulphur content, from as low as 8 per cent S up to 30 per cent S. Marl, shale, and gypsum are the prominent constituents of the sedimentary rocks in which the sulphur is produced. The sulphur is separated from the associated minerals by fusion and liquation, the heat necessary for the conduct of the process being supplied by the burning of part of the sulphur. With the use of the Gill regenerative furnace,[a] the recovery of the sulphur is about 80 per cent, whereas in the old process, where the burning and liquation was carried out in heaps, the recovery was about 60 per cent. This first liquated sulphur, containing 2 to 5 per cent of impurities, is put on the market for acid manufacture in dirty, yellow lumps of irregular shape and size. Refined sulphur is obtained by distillation of the crude material.

During the early years of the sulphuric acid industry in the United States Sicilian brimstome was practically the only surphur-bearing raw material used. In 1882 only two plants were using pyrite, the rest burning brimstone. The consumption of brimstone in the United States in 1882 was nearly 100,000 tons, about 90 per cent of which was used for acid manufacture.

In 1895[a] the consumption of Sicilian brimstone in the United States was about 165,000 tons, of which about 90,000 tons were used for acid manufacture.

In 1900[b] the importation of Sicilian sulphur was about 168,000 tons, but only about 50 per cent of this was used for acid manufacture. In 1905[b] the Sicilian importation had decreased to less than 75,000 tons, and in 1910[a] less than 5,000 tons. The chief reason for the drop in importation between 1890 and 1895 was because the acid manufacturers in this country were rapidly adopting the use of pyrite in place of brimstone. One of the main causes for the use of pyrite in the place of brimstone for sulphuric acid manufacture during the period around 1895 was the advance in the price of sulphur from about $15 per ton in New York to about $25 per ton. This advance was brought about through an agreement made between the Anglo-Sicilian Sulphur Co. and the mine owners, by which the sulphur company controlled at least 75 per cent of the total production of sulphur in Sicily, the company then raising the price. Although the requirements of brimstone for acid manufacture were decreasing from 1900 on, the requirement for brimstone for the paper-pulp and other chemical industries were constantly increasing. However, in 1904 and 1905 the mining of sulphur from the Louisiana deposits by the successful application of the Frasch process resulted in the American product largely supplying the American market to the exclusion of the Sicilian material. All the brimstone requirements of the United States since that time have been met almost entirely by domestic sulphur, with the exception of about 30,000 tons per year on the Pacific coast, which is supplied by Japan, and which is used principally in the paper-pulp industry of the Northwest.

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[a] Thorpe, T. E., Dictionary of applied chemistry; Sulphur. Vol. 5, 1913, p. 286-312.

[b] Figures are from annual volumes of "Mineral Industry," for the years mentioned.

The consumption of brimstone sulphur in this country increased steadily in the period 1900 to 1915, but the increase was due to the growth of the paper-pulp and other chemical industries and not to an extension of the use of brimstone in the sulphuric acid industry. In the period 1910 to 1914, the average consumption of brimstone sulphur in this country was about 300,000 long tons, of which less than 35,000 tons was used in the acid industry.

SULPHUR FROM COASTAL PLAINS OF LOUISIANA AND TEXAS.

The sulphur deposits of Louisiana and Texas are geologically associated with the " dome formations," which are a feature of the coastal plains extending through the States of Louisiana and Texas, into the Gulf States of Mexico. The term "dome" refers to the geologic structure, and the formations are not always indicated by surface elevations. In some places they are indicated by mounds varying from 10 to 80 feet in elevation above the level coastal plains. In some of these domes are found petroleum, rock salt, and sulphur. The oil was first exploited, and it was when drilling for oil near Lake Charles, La., that the first sulphur bed was discovered in 1865. Since then extensive deposits of sulphur have been found in several plains in that district. The most easterly discovery is at Belle Isle, St. Marys Parish, La., and the most westerly at Matagorda Bay, Big Hill, Matagorda County, Tex. These two points are about 225 miles apart, in a northeast and southwest line.

At the domes which are now being mined for sulphur the sulphur lies at a depth of between 600 and 1,100 feet. The overburden consists of clays, sands, quicksands, and gravels, and a comparatively small layer of a soft limestone. The average thickness of the sulphur bed is 125 feet. Beneath the sulphur is gypsum, with occasional layers of sulphur.

Between 1868 and 1895, many attempts were made to obtain the sulphur by ordinary shaft mining and by modifications of the shaft method. All of these attempts failed, owing to the difficulty of resisting the lateral pressures upon the shaft walls of the enormous amount of water in the quicksands encountered, and also the difficulty of preventing the inrush of water from the sands into the sulphur bed, when it had been penetrated.

The present successful method of mining the sulphur was worked out by Herman Frasch, during the years 1892 and 1902, at the sulphur deposit situated near the Parish of Calcasieu, La., 80 miles from Port Arthur, Tex., which deposit Frasch and his associates acquired in the name of the Union Sulphur Co.

The Frasch process involves introducing superheated water into the sulphur beds, through a pipe extending through the quicksands, at a temperature at or above the melting point of sulphur, and then raising the molten sulphur through another pipe to the surface by compressed air. The molten sulphur is then conducted into bins where it solidifies. The wells are 10 to 12 inches in diameter, and contain three strings of concentric pipes. In the outer annular space, the hot water at a temperature of about 175° C. is forced down under a pressure of 250 pounds per square inch. In the inner pipes, hot air at a pressure of 400 pounds per square inch is admitted. The hot water leaves the outer pipe at several points slightly above the bottom of the pipe, enters the sulphur-bearing formation, and after the brimstone has been thoroughly heated, additional quantities of water, which is constantly being forced into the formation, melt the sulphur (melting point 115° C.), which sinks toward the bottom of the sulphur bed, to the bottom of the well. Hot compressed air is forced down the inner pipe, which is slightly longer than the others, issues from the bottom of that pipe, and flows up through the intermediate annular space between the air pipe and the second pipe. As the liquid sulphur covers the entrance to that annular space, the sulphur is lifted to the surface by the ascending air. One of the most important features of the process is the maintenance of proper balance between the pressure of the superheated water, and the air pressure, so as to permit an uninterrupted flow of sulphur to the surface. On reaching the surface the sulphur is conducted through a pipe, supported on light framework, to a bin in which it solidifies. There are a series of bins, about 150 feet by 250 feet by 65 feet high. The sulphur is delivered into the center of these bins, and caused to spread in layers about one inch in thickness.

The method of mining sulphur described above was patented by Frasch in 1891. In 1905, 1910, and 1911 further patents were obtained to cover certain details in the process. With the belief that at the expiration of the Frasch patent, in 1908, the fundamentals of the process became public property under the provisions of the patent laws, the Freeport Sulphur Co. started the operation of a property in Texas, using a modification of the process. The consequence has been recent litigation involving the patents granted in 1905 and 1910 to the Union Sulphur Co. As a result of the litigation, which was carried to the highest courts, the process is now open to all.

Crude oil is used for firing the boilers to supply the necessary heat and power, and the commercial success of the Frasch process is due in a large measure to the local availability and cheapness of the fuel oil. It has been estimated that of the total heat units employed less than 2 per cent are utilized in melting the sulphur. The temperature of the quicksand water, of which there is a great influx to the sulphur bed during the operation of the process, is low and has to be raised before the sulphur can be melted. The well gives out when the cavity from which the sulphur has been extracted becomes too large to permit of the necessary temperature being maintained.

The rocks above the sulphur-bearing beds are not strong enough to support the dome after much sulphur has been extracted. At the property of the Union Sulphur Co., which has been worked steadily since 1895, it has been necessary to employ a dredge constantly to pump material from adjacent areas onto the settled ground in order to hold the level. It is estimated that in places at this property the original surface is 200 feet below the present surface, which at the most is only about 25 feet above sea level.

The development of a sulphur property and the equipment for operation requires large expenditures. Prospecting can only be done satisfactorily by drilling, the number of drill holes necessary to establish the existence of a deposit varying with the nature of the deposit. In recent years it has cost in the neighborhood of $5,000 per hole for drilling at plants located near good transportation facilities. At the present time it would probably require an investment of one to two million dollars to develop and place in production a property extending over an area of perhaps 300 acres. A large quantity of sulphur must, therefore, first be actually determined to insure the return of the invested capital plus a reasonable profit.

There are now three properties producing sulphur by the use of the Frasch process or a modification of that process: The Union Sulphur Co., at Sulphur, near Lake Charles, La.; the Freeport Sulphur Co., at Bryant Heights, Tex.; and the Texas Gulf Sulphur Co., at Matagorda, Tex.

UNION SULPHUR CO.

The Union Sulphur Co. in 1902 began to produce sulphur on a practical scale, and by 1905 the production had increased to over 200,000 long tons per year. From that time the yearly production was usually greater than the requirement, and some stocks were accumulated above ground. By October, 1917, when a special commission of the Bureau of Mines and the United States Geological Survey visited the property, the production had been increased to 2,000 tons per day, which at that time was considered a maximum output with the equipment installed. There were then more than 800,000 long tons of sulphur above ground at the property.

Under the stress of the war-time requirement, and the necessity of maintaining an adequate stock above ground to meet any emergency, the production was further increased during the first six months of 1918, till by June, 1918, the production had reached nearly 4,000 tons per day, and the stock above ground had been increased to about 1,000,000 tons.

The operations of the company were interrupted on August 7, 1918, by a tornado which blew down all the derricks over the wells, all the pipe lines, etc., and also the smokestacks of the boiler plants. Within a few weeks, however, new wells had been drilled and equipped with piping and connected to the boilers and mining resumed. By early October the production was again about 4,000 tons per day, and could have been still further increased.

Brimstone is shipped from Sulphur, La., by rail direct to the points of consumption, or over a special line 68 miles long to Port Sabine, Tex., where it is loaded onto ships. Prior to 1917, about one-fourth of the total shipment was made all rail, and three-fourths by rail to Sabine and then by ships.

For an average daily production of about 2,000 tons, there are required about 4,000 barrels of fuel oil. The labor required for production at this rate is about 800 men. About 8,000,000 gallons of water are pumped and heated each 24 hours.

The sulphur-bearing deposit at this property is only about 64 acres in extent, but is apparently of unusual richness, and it is believed may be depended on for many years to produce sulphur at a reasonable cost. During the war period the mining cost rose to about $10 per ton, but prior to 1917 was less than $6 per ton. According to a report of the Federal Trade Commission (S. Doc. No. 248), the cost during the first half of 1917 was $5.75 per ton.

FREEPORT SULPHUR CO.

The property of the Freeport Sulphur Co. is located at Bryant Heights, about 40 miles from Galveston, and within 3 miles of the coast. The deposit comprises a number of scattered bodies spread over a large area (about 520 acres), considerably larger than that worked by the Union Sulphur Co. On account of this fact the cost of production at Freeport undoubtedly is a little higher than at the Union property. According to the report of the Federal Trade Commission (S. Doc. 248), the cost during the first six months of 1918 was $6.15 per ton.

The company began to produce in 1913. During the first nine months of 1917 the production averaged about 1,500 tons per day, which was considered to be the maximum rate of production with the equipment then installed.

In working this property to produce 1,500 tons per day, about 8,000,000 gallons of water are pumped and heated. The boiler capacity of the plant is about 25,000 horsepower.

TEXAS GULF SULPHUR CO.

The property of the Texas Gulf Sulphur Co. is located on the Matagorda Big Hill, in Matagorda County, Tex., within one-half mile of Matagorda Bay and about 6 miles from the deep water of the Gulf. The property is reached by a branch of the Atchison, Topeka & Santa Fe Railway from Bay City to Matagorda.

The company's holdings cover 300 to 400 acres, on or adjacent to the mound, which itself covers 200 to 300 acres, and rises about 35 feet above sea level. Matagorda Big Hill is a typical "saline dome." Extending to a depth of 800 to 1,000 feet below the surface is sand, shale, clay, and gravel; below these unconsolidated sediments is a "cap rock" of limestone. The sulphur occurs immediately below the limestone at depths of 870 to 1,215 feet, depending on its location in the dome, and varies in thickness from 60 to 90 feet. A stratum of salt and gypsum is found underneath the sulphur bed. The average sulphur content of the sulphur bed varies from 20 to 40 per cent. It is estimated that there are over 10,000,000 tons of sulphur available in the deposit.

Actual operations were started early in March, 1919. Several wells are now in operation, producing about 1,500 tons a day.[a]

OTHER PROPERTIES.

Besides the three properties mentioned, which are now mining sulphur, the following properties on the coastal plain are possible potential producers:

1. The Texas Exploration Co. property, Damon Mound, northwestern Brazoria County, Tex., about 35 miles northwest of Freeport on a branch of the Southern Pacific Railway connecting with the

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[a] See news item, Operations of the properties of the Texas Gulf Sulphur Co., Eng. and Min. Jour., vol. 107, Mar. 29, 1919, pp. 555–557.

main line at Rosenberg, 18 miles north of Damon Mound. It is claimed that at least 3,000,000 tons of sulphur have been definitely developed by drilling.

2. The Texas Co. property, Haskins Mound, Brazoria County, Tex., 4 miles west from Chocolate Bay and 8 miles northwest from the Gulf Coast.

Many other localities along the coastal plains offer possibilities for developing sulphur deposits, but none of them has been sufficiently prospected to estimate the reserves, or the conditions for mining. Some of the localities which have known possibilities for production are: (1) Hackley, in Harris County, 25 miles northwest of Houston; (2) Liberty, about 3 miles south of Liberty Station on the Southern Pacific Railway; (3) Barbers Hill, 9 miles southeast of Wattey Station; and (4) Hackberry Island, in Cameron Parish, La., 18 miles southwest of Lake Charles, and 12 miles from the Gulf coast. In fact, the Gulf coast district offers promises for the development of several large deposits in the future, as the demand for surphur increases. It is rather doubtful, however, whether there will be any extensive development of these deposits for years to come. A deposit, to be successfully worked, would have to occur under conditions exceptionally favorable for low cost of production and have easy transportation facilities.

Prior to the extraordinary condition created by the war, the Union Sulphur Co. and the Freeport Sulphur Co. were more than able to care for the brimstone demand in this country. To the production capacity of these two companies is now added that of the third, the Texas Gulf Co. The future requirements for brimstone are rather problematical, as it is not certain to what extent brimstone will continue to be used in acid manufacture in place of pyrite. To compete with pyrite, brimstone will probably have to sell at a price which will not encourage anyone not now in the field to make heavy investments in the development of the "domes."

SULPHUR DEPOSITS IN WEST TEXAS AND OTHER DISTRICTS IN THE WEST.

Within the last 15 years several attempts have been made to mine and extract sulphur from the deposits found in an extensive belt of gypsum in Culberson County, Tex.[a] So far these attempts have not been an economical success.

The sulphur occurs in the gypsum and limestone beds either as layers more or less parallel with the stratifications of the rocks, or as cementing material within the coarsely crystallized gypsum, or as amorphous bunches within the rock.

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[a] Richardson, G. B., Contributions to economic geology—salt, gypsum, and petroleum in trans-Pecos Texas, U. S. Geol. Survey Bull. 260, 1904, pp. 573–585; Porch, E. C., jr., The Rustler Springs sulphur deposits, Univ. Texas Bull. 1722, April 15, 1917, pp. 57–59.

The relatively most extensive operations with this material have been conducted by the Michigan Sulphur & Oil Co. An attempt was made to extract the sulphur by the White steam process, which consisted of loading sorted ore, containing about 40 per cent sulphur, into perforated sheet-iron cars, and running the cars into a horizontal cylindrical retort, into which steam, at 60-pound pressure, was admitted for 2½ hours. About 60 to 65 per cent of the sulphur contained in the ore was liquated out, but on account of the high cost of fuel the production was unprofitable.

The West Texas Sulphur Co. has erected a plant to treat the ore under a modification of the steaming process described.

The district as a whole appears to have a large quantity of sulphur, apparently scattered through a large number of small deposits. It is problematical whether any one of these could be exploited to advantage by individual efforts, under the present conditions as to market, etc., but the deposits are potential sources of supply for the future.

In 1918 some tests were conducted by J. M. Hyde at the Bureau of Mines experiment station at Berkeley, Calif., to determine the possibility of recovering the sulphur from this ore by flotation. These tests showed that a high recovery, about 80 per cent, could be obtained in a concentrate carrying about 85 per cent sulphur.

Various small sulphur deposits have been located in Colorado, chief among them being the Vulcan mine, near Iola, in Gunnison County, and the property of the Colorado Sulphur Production Co., near Creede, in Mineral County. The Vulcan mine has been operated at intervals for the past 20 years, but so far unsuccessfully. The distillation of the sulphur from this mine has resulted in a product containing selenium, which is detrimental to the use of the sulphur in the manufacture of acid. The property near Creede has not been worked, though an effort was made in 1918 to start operations there.

In Wyoming, deposits of sulphur have been found in various places,[a] but the only two properties that have been worked are those near Cody, in Park County, and Thermopolis, in Hot Springs County. The Cody Sulphur Co. and Yellowstone Sulphur Co. have operated intermittently during the last 20 years near Cody, but, primarily because of the difficulties in obtaining an economical recovery, the production has been small. Sulphur deposits near Thermopolis have also been worked by various companies, but the production has been small. It is not probable that this Wyoming district will ever become a large and constant producer of sulphur.

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[a] Woodruff, E. G., Sulphur deposits at Cody, Wyo., U. S. Geol. Survey Bull. 340, 1907, pp. 451–456; Sulphur deposits near Thermopolis, Wyo., U. S. Geol. Survey Bull, 380, 1909, pp. 373–380. Hewett, D. F., Sulphur deposits of Sunlight Basin, Wyo., U. S. Geol. Survey Bull. 530, 1911, pp. 350–362; Sulphur deposits in Park County, Wyo., U. S. Geol. Survey Bull. 590, 1914, pp. 477–480.

In Utah, sulphur has been reported at various places. The only producing property is that of the Utah Sulphur Corporation, located 27 miles from Black Rock on the Salt Lake Railroad, at a mining camp called Morrissey (formerly Sulphurdale). The deposit has been described by Lee.[a] The sulphur produced in this property has been sold to the beet-sugar refineries. On account of the high cost of recovery, and the long haul, this sulphur could not be considered available for acid manufacture in the East.

In Idaho a sulphur deposit is being developed by the Idaho Sulphur Co., about five miles east of Soda Springs (on the Oregon Short Line Railroad) in Bannock County. The deposit has been described by Richards and Bridges.[b] The commercial possibilities of this project are not yet demonstrated. If the treatment problem is solved successfully this property probably can produce a considerable tonnage for the Pacific coast market.

In California sulphur showings are reported in various districts, but from the information available regarding them it is apparent that they are small and relatively unimportant as far as constituting a possible source of supply to the acid industry of the Pacific coast is concerned.

In Nevada the two producers are the property of the Cuprite Esmeralada Sulphur Co., at Cuprite, Nye County, and the property of the Nevada Sulphur Co., located at Sulphur, Humboldt County.

The western deposits, as a rule, are of uncertain character, and their tonnage yields would be comparatively small. Their general great distance from consuming centers has been detrimental to their development in the past and is likely to remain so in the near future. However, with proper solutions of the treatment problems and improved transportation facilities the aggregate production from these deposits may be made to take care of the western consumption.

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[b] Richards, R. W., and Bridges, J. H., Sulphur deposits near Soda Springs, Wyo.: U. S. Geol. Survey Bull. 470, 1910, pp. 499–503.

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PYRITE.

GENERAL CONSIDERATIONS REGARDING CHEMICAL CONSTITUENTS.

Pure pyrite contains 53.4 per cent sulphur and 46.6 per cent iron. Pyrite suitable for acid manufacture should contain in general as much sulphur as possible. Under ordinary conditions most of the acid manufacturers require a pyrite containing not less than 42 per cent sulphur. Under extraordinary conditions, such as existed in certain localities during the war, pyrite containing as low as 30 per cent sulphur was used. Pyrite containing less than 30 per cent usually was not used alone, but in conjunction with pyrite higher in sulphur or with brimstone.

The content of available sulphur in general determines the value of the pyrite to the consumer, although the physical characteristics of the ore also are important. With pure ores and with the proper types of roasters and skillful operation it is possible to reduce the sulphur content of the cinder to less than one-half per cent. In practice, however, the sulphur content of the residue is seldom less than 2 per cent. With ores containing impurities, such as zinc, copper, lead, lime, and magnesia, it is practically impossible to reduce the sulphur content to such a low percentage, even with the most skillful manipulation. This is due largely to the formation of sulphate of these metals, which are not decomposed by the temperature of the roasters.

Discussing the question of the effect of these impurities on the availability of the sulphur, Falding[a] says:

> When ores contain among others of minor importance the following minerals, they will, at the ordinary temperature of burners used by sulphuric acid manu-

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[a] Falding, F. J., The manufacture of sulphuric acid: Mineral Industry, vol. 7, 1898, p. 653–654.

facturers, retain in chemical combination the following proportion of sulphur, which will, therefore, not be available for making acid:

For each per cent of	Cu	Zn	Pb	CaO	MgO
There will be found (per cent S)	0.50	0.50	0.15	0.57	0.80

This is on the assumption that all the sulphides are converted to sulphates, which is by no means the case.

The amount of sulphur retained by these substances varies according to the roasting condition and to the physical character of the ore, and actual operating experience with any particular ore is necessary to determine the actual sulphur retained by it. For example, during a recent experiment conducted over several months by a large and carefully operated acid plant, in which noncupreous Spanish pyrite was burned in comparison with a domestic copper ore, the latter, in spite of its copper content, yielded a cinder with an average sulphur content 0.4 per cent less than the noncupreous Spanish ore. This result was due to the fact that the physical characteristics of the domestic ore made it much more free burning than the fine textured, noncupreous Spanish ore. With zinc, lead, lime, or magnesia present the retention of sulphur by these impurities would be more nearly as indicated above, regardless of the physical condition of the ore.

In general, the figures in the preceding table give a basis for a settlement in the absence of any data obtained from actual roasting of ore. For example, an ore containing, say, 42 per cent sulphur, and 3 per cent zinc, 2 per cent CaO, and 1 per cent MgO, will have only about 37.6 per cent available sulphur. The impurities will retain 3.4 per cent, and the calcine from even a pure ore will retain the equivalent of at least 1 per cent of the sulphur in the original ore, so that the total unavailable sulphur is about 4.4 per cent, giving 37.6 per cent as available, or about 90 per cent of the total sulphur content.

Pyrite ore is usually sold at a price per unit of sulphur by analysis. If the ore mentioned above is sold at a price of 10 cents per unit the cost of the ore to the consumer is $4.20 per ton (2,240 pounds). However, as only 90 per cent of the sulphur is available for acid manufacture, the actual cost of the available sulphur per unit is 11-1/9 cents.

With the same proportion of impurities, an ore having a higher sulphur content is of greater value per unit of sulphur than an ore having a lower content. Assume two pyrite ores to be free from the impurities that would retain sulphur, one containing 45 per cent sulphur, and the other, 40 per cent sulphur. It is readily possible that under suitable roasting conditions the sulphur content of the residues from the two ores may be reduced to 2.0 per cent. However, in order to obtain the same units of available sulphur, it is necessary to roast 1.125 tons of the ore carrying 40 per cent sulphur for every ton of the ore containing 45 per cent sulphur. Thus the cost of freight, loading, unloading, crushing, and roasting per unit of available sulphur is 12½ per cent greater for the 40 per cent ore than for the 45 per cent ore.

As regards the proportional values of sulphur in 45 per cent ore and in 35 per cent ore the difference is still greater, because it is well-nigh impossible to reduce the sulphur content of the cinder as low in burning 35 per cent ore as in burning the 45 per cent ore, without the use of a special type of roaster or of external heat. The cinder from an ore containing originally only 35 per cent sulphur will seldom carry less than 2½ and usually carries 4 per cent sulphur. Thus, in order to obtain the same number of available units of sulphur, it is necessary to handle 37 per cent more of the 35 per cent ore than it would of the 45 per cent ore.

The other constituents of the ore which have a deleterious effect in the manufacturing processes, or which reduce the value of the pyrite for acid manufacture, are arsenic, selenium, and other volatile metallic compounds, including compounds giving off chlorine or fluorine in roasting.

Arsenic and selenium in proportions less than 0.20 per cent are of little or no consequence in the manufacture of acid by the chamber process. In fact, at several chamber plants, ores containing as high as 1.0 per cent are being utilized. However, with a large proportion of arsenic present, the fumes of arsenic trioxide tend to clog the flues and towers, and the acid produced therefrom contains sufficient arsenic to corrode the chambers. Arsenic is very deleterious to the contact process, and when ores containing even a trace of arsenic are used in connection with this process, the arsenic must be completely removed by an elaborate and rather expensive cleaning system. If the ores contain more than 0.2 per cent arsenic the necessary cleaning system would be so elaborate that the cost of removal would be excessive, and ores with that high an arsenic content are not suitable in any way to the contact process.

With the proportions commonly encountered in pyrite ores, these impurities are seldom present in the acid in amounts of any consequence to the fertilizer manufacturer, or to some other manufacturers. In acid intended for " pickling " iron previous to tinning, or to galvanizing, or for the drug trade, or for the general use of the chemical trade, they are inadmissible. In general, ores containing less than 0.1 per cent arsenic are termed nonarsenical and are sold for a higher price than arsenical ores. The differential in price, as a rule, is between 0.5 and 1.0 cent per unit. As a matter of fact, the penalty for any arsenical ore, especially ore with a high arsenic content, may well be as much as 2 cents per unit in certain localities.

Volatile metallic compounds are deleterious in that they are carried into the flues and tend to clog the Glover towers and to make " dirty " acid—that is, acid containing these metals either in solution or in finely divided suspensions.

Chlorine and fluorine are especially undesirable at contact acid plants, as will be discussed in a subsequent connection.

Fluorine is injurious to the lead chambers, and to the packing in the Glover tower at acid plants. Thus, fluorides are not desirable in pyrite.

Another objectionable impurity in pyrite is coal, from which hydrocarbons may be distilled, carrying off carbon which contaminates the acid. Coal or carbon is objectionable in the raw material for contact plants, as any carbon monoxide which may be formed is a detriment to the contact process.

GENERAL DISCUSSION REGARDING PHYSICAL CONDITION.

Although there have been no widely accepted standards, pyrite has been sold generally in three sizes—lump, " furnace," and fines.

Lump ore contains no pieces over 18 inches in size, and all the fines have been screened out.

" Furnace " ore has been sized through a 2½-inch or 3-inch screen, or ring, onto a ¼-inch screen. Not more than 5 per cent of the ore should be finer than one-quarter inch.

More careful sizing of " furnace " ore than the above should be employed to get the best results in lump burners. This feature is discussed in connection with the operation of lump burners.

Fine ore includes all ore and concentrate which will pass through a ¼-inch screen.

A large consumer having burners for both lump and fines may buy lump ore or " run-of-mine ore " and crush and screen it to provide the desired proportions of lump and fines. The purchaser is usually allowed 25 to 50 cents per ton to cover the cost of crushing and screening.

In this country heretofore it has been customary to price Spanish ore fines at about 2 cents per unit of sulphur less than the price of furnace size.

Some ores act explosively or decrepitate in the burners. Thus certain furnace-size ores may produce a large amount of fines in the burners, which will fall through the grates unburned, causing high sulphur losses and possibly other detrimental features, such as clinkering and matting on the grate bars. Decrepitation is due generally to the presence of hydrated silicates and can be prevented only by a preliminary heating before burning.

Certain pyrite ores burn more readily than others—that is, are free burning—because of the physical character of the particles of ore, whether granular or in a dense mass of fine-grained particles. Such characteristics can be determined only by test.

PYRITE-BURNING CAPACITY IN UNITED STATES.

The total sulphur requirements in the form of fine and lump pyrite ore, if all pyrite-burning equipment in this country should be operated at capacity on pyrite alone, would amount to 840,000 long tons, of which 480,000 tons would be sulphur in lump ores. This would be equivalent to about 2,500,000 tons of pyrite containing 40 per cent sulphur.

Of the total pyrite requirements almost 50 per cent is for the acid plants in zone 1—that is, along the Atlantic seaboard north of the North Carolina line. The following table gives the approximate requirements of sulphur in the form of lump and fine pyrite in the several zones:

Sulphur required in the form of pyrite to operate all plants in United States equipped with pyrite burners.

Zone.	Fines.		Lump or furnace size.	
	Long tons.	Percentage of total fines.	Long tons.	Percentage of total lump.
1	290,000	60.4	135,000	37.5
2	53,000	10.9	63,000	18.0
3	27,000	5.5	19,000	5.2
4	57,000	12.0	138,000	37.8
5 and 6	53,000	11.2	5,000	1.5
	480,000	100.0	360,000	100.0

SPANISH PYRITE.

The pyrite deposits of southern Spain and Portugal are by far the most important in the world, as before the war they supplied about 70 per cent of the world's consumption of pyrite. The area in which deposits are situated is about 100 miles long by 12 to 18 miles mide and extends from Aznol-Collar, in Spain, to San Domingos, in Portugal. The total resources of ore in this district are estimated, by J. H. L. Vogh, a Norwegian geologist, to be about 1,000,000,000 tons.

The annual production from this area is about 4,000,000 tons, of which 400,000 tons is obtained from Portugal, the rest from Spain.

In 1910 the exports of pyrite from Spain were distributed about as follows:

Exports of pyrite from Spain, 1910.

To—	Long tons.
United States and Canada	700,000
Germany	800,000
England	800,000
France and Belgium	500,000

Only the high-grade smelting ores, ores of low sulphur content, and a small amount diverted to the local phosphate industry are retained in the country.

The ores may be classed roughly as follows:

1. Ore containing over 5 per cent copper, smelting grade, retained in Spain.

2. Ore containing 1½ to 5 per cent copper. This ore is largely exported to European points for the recovery of copper, sulphur, and iron.

3. Ore containing about 1½ per cent copper.

4. Ores containing too small a percentage of copper to warrant recovery of the copper. These ores are sold only for the sulphur content.

The deposits are worked by open-cut methods, with a mining cost, including cost of removal of the overburden, of approximately $1 per ton. The ore is transported 30 miles to Huelva, where it is dumped into ore pockets, from there into vessels. Ore containing 49 per cent sulphur has been sold f. o. b. Huelva for less than $3 per ton.

A considerable part of the ore of class 3, which is shipped to America, is first treated at the mines by being spread out in beds and exposed to the weather. The beds are turned over or stirred at intervals and are frequently wet down with water to leach out the copper, which has been rendered soluble by the atmospheric oxidation and by the action of ferric sulphate. In about three years' treatment of this kind the copper content is reduced to about 0.3 per cent, the iron pyrite remaining practically unchanged. The sulphur content is frequently increased. The ore is then sold as "washed ore."

Two of the companies selling Spanish pyrite ores in this country dispose of part of the copper-bearing unwashed ores under a form of contract by which the sulphur content alone is paid for, the pyrite cinder reverting to them. These companies have plants for treating the cinder for the recovery of the copper by a chlorination and lixiviation process, after which the residue is sintered and shipped to the iron furnaces.

The chief importers of Spanish pyrite ore in this country have been:

Pyrites Co. (Ltd.); offices in London and New York; leaching and sintering plants at Wilmington, Del., and Roanoke, Va.

Pennsylvania Salt Mfg. Co.; offices in Philadelphia, Pa.; leaching and nodulizing plants at Philadelphia and Natrona, Pa.

Naylor & Co.; offices in New York.

Davis Sulphur Ore Co.; offices in New York.

Ladenburg, Thalman & Co.; offices in New York. This company ships ore from Pomaron, Portugal.

In 1895 and 1905 the New York price for Spanish ore was 10 cents per unit of sulphur. Just before the war the price was 12 to 12½ cents per unit. At that time freight rates from Spanish ports to New York were between $2.25 and $2.50 per ton. In the contracts for the sale of Rio Tinto ore prevailing before the war, when the cinder was retained by the buyer, $1 to $1.50 per ton of pyrite was charged in addition to the charge for sulphur. This charge was based on the value of the iron content of the ore to the iron industry. The treatment of the pyrite cinder to prepare it for the iron blast furnace, such as briqueting, nodulizing, and sintering, is discussed elsewhere in this report (pp. 204 to 207).

The sulphur content of the Spanish ore imported to this country varies between 45 and 50 per cent—the lump will run 47 to 49 per cent and the fine 45 to 47 per cent. The arsenic content occasionally runs as high as 0.8 per cent, but averages about 0.36 per cent. The lead and zinc contents usually total less than 1 per cent.

Prior to 1890 the importation of Spanish pyrite was less than 20,000 tons. During the period 1890 to 1900 the importations had increased to about 300,000 tons per year. By 1910 the importations had increased to 700,000 tons. In 1914 about 900,000 tons were imported. The greatest tonnage imported in any year was in 1916, when 1,200,000 tons were received, the heavy demand, of course, being due to the large acid requirements for the manufacture of munitions. In 1917 the importation was reduced to about 750,000 tons, this decrease being due to the shortage in ships.

The difficulty of obtaining ships became even greater in the early months of 1918, and the importations in the first three months averaged less than 50,000 tons per month. In April, 1918, it became necessary for the United States Shipping Board to ask for a still greater curtailment in the importations. As a result of a conference held under the auspices of the War Industries Board in April, at which representatives of the importers and the consumers were present, the importations were restricted to a total of 125,000 tons between April 1 and October 1, 1918. The amount of pyrite actually imported during that time, however, was less than the allowable

125,000 tons. The total importations of Spanish ore during the year 1918 was about 270,000 tons.

The principal ports of entry of the Spanish ore for the last five years have been New York, Philadelphia, and Baltimore, between 55 per cent and 60 per cent of the total importation going through these ports. Charleston, S. C., and Savannah, Ga., each receive about 10 per cent, most of the rest being received at Boston, Mass., Norfolk, Va., Wilmington, N. C., Jacksonville, Fla., and New Orleans, La.

During the war the price of Spanish ore was greatly increased over the prewar prices, because of the high freight rates. The ore was sold to the consumer usually on a basis of the old prewar quotations plus the excess freight charges, which brought the price in the South Atlantic ports to as high as 35 cents per unit, with an average of perhaps 30 cents.

Since the first of the year, 1919, the freight rates from Huelva to New York have been decreased to $3.50 to $4 per ton. With that rate the Spanish ore was quoted in July in New York at about 16 cents per unit of sulphur.

Spanish ore is sold both in "furnace size" and in fines size, the furnace ore going primarily into the South, where the greater proportion of the plants having lump-burner equipment are situated, and the fines going to the northern acid plants. It has been customary to price the Spanish fines at about 2 cents per unit less than the market price of the furnace size. This is due to the fact that as a rule the Spanish ore is of very fine texture and the fines from the ore contains a great deal of "float dust." This fine dust rising with the gases from the furnace tends to clog the flues, towers, and the entire chamber system, and the fines tend to cake in the hottest part of the furnace. In fact, Spanish fines have given so much difficulty in manipulation that the acid manufacture has penalized the fines to some extent, though as a matter of fact the differential is arbitrary.

DOMESTIC PYRITE.

GROWTH IN PRODUCTION.

Prior to 1885 the production of pyrite in this country was less than 50,000 tons per year. By 1890 the production had been increased to about 100,000 tons per year, and this was about the rate of production till 1895 and 1896. At that time the new acid plants in the South were beginning to require more pyrite, with the result that the production was rapidly raised to about 200,000 tons per year in 1900. About 70 per cent of this production was from Virginia and North Carolina, 25 per cent from Massachusetts and New York, and the rest from California and Colorado. By 1905 the production had increased to about 250,000 tons, and this was approximately the rate up to and including 1910. Of this production, about

48 per cent came from Virginia, 20 per cent from California, 20 per cent from Massachusetts and New York, 7 per cent from Alabama and Georgia, and the rest largely from Illinois and Ohio. Since 1910 the production has been as follows:

Production of pyrite in the United States, 1911–1917.[a]

Year.	Tons.	Year.	Tons.
1911	299,904	1915	394,124
1912	350,928	1916	423,556
1913	341,338	1917	462,662
1914	336,662	1918	464,494

[a] From statistics compiled by United States Geological Survey.

In 1913 the total production, about 341,000 tons, was obtained from the States as follows:

Production of pyrite by States, 1913.

From—	Tons.	Per cent.
Virginia	148,200	43.5
California	70,500	20.6
Wisconsin	25,200	7.4
Georgia	11,100	3.2
Illinois	11,200	3.3
Indiana and Ohio	14,800	4.4
Other States	60,000	17.6
Total	341,000	100.0

In 1918 the total production, about 464,000 tons, was obtained as follows:

Production of pyrite by States, 1918.[a]

From—	Tons.	Per cent.
Virginia	143,427	30.8
California	111,861	23.9
New York	63,982	13.7
Georgia	31,315	6.7
Illinois	24,369	5.2
Colorado	18,817	4.5
Ohio	9,845	2.1
Missouri	7,674	1.6
Other States	53,204	11.5
Total	464,494	100.0

[a] From statistics compiled by United States Geological Survey.

OCCURRENCE OF THE PYRITE.

The principal pyrite deposits of the eastern half of the United States are found in the Appalachian Mountain range in scattered districts from New England to Alabama, the principal commercially exploited deposits being found in northern New York, in Virginia, northern Georgia, and in northeastern Alabama.

Pyrite is also obtained in Missouri, Colorado, and other Western States. California also is a large producer of pyrite.

In southwestern Wisconsin a marcasite ore is found, but the greatest production in that district is obtained as a by-product in the concentration of zinc blende from a mixture of zinc and iron sulphites.

As a general rule, the domestic pyrite ores, when mined, produce more fines than they do lump ore. The average proportion is two-thirds fines and one-third lump. This fact has caused considerable difficulty during the last two years in marketing the pyrite produced in the southern field. The southern pyrite has been primarily fine ore and fine concentrates from milling operations, whereas the greater proportion of the southern plants are equipped for burning lump or furnace ore. The northern pyrite producers, however, have had no difficulty in disposing of their fines as well as their lump ore output, as the furnace equipment in the North consists primarily of fines burners. The distribution of fines and lump burners in the various sections of the country is discussed elsewhere in this report (pp. 63 to 69). A large proportion of the ore in the East must be crushed and concentrated before it is put on the market. The average eastern domestic pyrite—lump, fines, or concentrates—will run about 40 per cent sulphur. An occasional mine or concentrating mill will produce material running as high as 45 or 47 per cent sulphur, and, on the other hand, some material runs as low as 35 per cent sulphur.

The ores as a rule are very low in phosphorus and arsenic. They frequently contain copper in proportions varying up to 2 or 3 per cent, with small amounts of lead and zinc.

The domestic fines and concentrates as a rule are less difficult to roast than the Spanish fines, because the individual grains of pyrite appear to be coarser and there is less tendency for the material to dust and to clog the hearths.

PYRITE MINES IN UNITED STATES.

A brief mention may be made of the mines in the country which have been producing ore recently, or which have made preparation to produce ore within the last year (1918).

New York and Massachusetts.—Prior to 1910 the Davis mine in the Charlemont district in Massachusetts was an important producer, but on account of a cave-in, the production was suspended in 1910. Since then the production in Massachusetts has been practically negligible.

In New York the principal producers during the last two years have been:

1. The mine of the St. Lawrence Pyrites Co., near Herman, in St. Lawrence County. This mine has been producing for more than

10 years. The crude ore runs about 20 per cent sulphur, and the concentrates from the mill run approximately 42 per cent sulphur.

2. The Northern Ore Co., in the Edwards district, St. Lawrence County. Pyrite is produced by this company as a by-product in zinc concentration.

3. The mine of the New York Pyrites Co., near Gouveneur, in St. Lawrence County. The company shipped lump ore during 1918 and is now prepared to ship concentrates.

Virginia.—Virginia has always been the largest producer of pyrite in the East. The principal producing or near-producing mines in Virginia are located east of the Blue Ridge in the central and northwestern parts of the State, in a well-defined belt which runs northeast through Buckingham, Fluvanna, Louisa, Spotsylvania, Stafford, and Prince William Counties. There are three producing mines grouped around Mineral, in Louisa County. The principal mines in this State are as follows:

1. Armenius mine, about 1¼ miles north of Mineral. Prior to 1916 this mine produced between 50,000 and 60,000 gross tons of lump pyrite and concentrates per year. Its production was reduced to less than 1,000 tons per month by a cave-in of the main shaft early in 1916. This mine is now being operated by the Grasselli Chemical Co.

2. Boyd-Smith mine: Three-fourths mile south of Armenius and 2 miles from Mineral. This mine was operated in 1918 by E. I. du Pont de Nemours Powder Co.; it ships mostly concentrates with a small output of lump ore.

3. Sulphur mine, near Mineral, in Louisa County. This mine was operated in 1918 by the Virginia-Carolina Chemical Co.; it has shipped for 35 years and the principal output now is concentrates and fines.

4. Julia mine, about 1 mile southwest of Mineral. This property was developed in 1918 by the Armour Fertilizer Co.

Other producing mines in the State are:

5. Old Dominion Sulphur Corp. mine, near Garrisonville, Stafford County, Va. The product shipped is a concentrate carrying 47 per cent sulphur.

6. Cabin Branch mines, near Dumfries, Prince William County, Va. This mine, owned in 1918 by the American Agricultural Chemical Co., ships lump ore and concentrates.

Several other deposits were developed to a greater or less degree during 1918, but no production was obtained from them.

South Carolina.—The only producer of pyrite in South Carolina is the mine of the Kershaw Mining Co. in Lancaster County. This mine, which was started early in 1918, has shipped a small tonnage of lump pyrite, but the product is principally a concentrate carrying copper.

Georgia.—Mine of the Chestatee Pyrite & Chemical Corp., at Chestatee, in Lumpkin County. This property was under extensive development in 1917 and 1918. In 1917 the shipments were lump ore, but in 1918 shipments of fines and concentrates were begun. The ore body here is the largest developed in the State. A power plant developing 1,000 horsepower has been installed, and a branch connecting with the Gainesville & Northwestern Railroad at Clermont has been completed.

2. Mine of the Standard Pyrites Co., in Cherokee County, 7 miles southeast of Ball Ground, on the Louisville & Nashville Railroad. This mine produces coarse granular pyrite, which is concentrated to a 45 per cent product. The product is free from arsenic and copper.

3. Mine of the Marietta Mining Co., at Marietta, in Cobb County. This mine produces a granular pyrite which is concentrated.

4. Mines of the Marietta Mining Co., at Villa Rica, in Colt County. developed during 1918.

5. Shirley mine of the Georgia Mining Co., near Hiram, Paulding County. Some ore has been shipped from this mine, but it is still being developed.

6. Little Bob mine, near Hiram, operated by Hanna & Co., of Cleveland. This mine is capable of producing about one-half lump ore: the remainder can be readily concentrated to 40 per cent sulphur.

7. Mine of the Sulphur Mining & Railroad Co., a subsidiary of the Virginia-Carolina Chemical Co., at Villa Rica, Carroll County. This mine has produced for 20 years up to 1918. Some work was done in 1918 toward re-treating some of the old tailings from the concentrator.

Alabama.—1. Property of National Pyrites & Chemical Co., Pyriton, Clay County. Both lump and concentrates are shipped. The ore carries about 1 per cent copper.

2. Carpenter mine, Pyriton, Clay County, owned by the Southern Sulphur Ore Co. In 1918 this mine produced lump ore. However, the fines ore can be concentrated to a suitable product

3. Mattison mine, near Pyriton.

Missouri.—1. Missouri Cobalt Co., of Fredericktown, Madison County, has shipped a concentrate containing copper, cobalt, nickel, and sulphur.

2. "Hobo" mine of the American Agricultural Chemical Co., situated about 6 miles southeast of Bourbon, Crawford County.

3. Cherry Valley iron mine, near Steelville, Crawford County.

4. Beulah mine, 1 mile south of Kelsey, operated by the Commercial Acid Co., of St. Louis.

Much of the ore mined in the "filled-sinks" area, which lies adjacent to the Frisco Railroad between St. Clair and Rolla in Franklin and Crawford Counties, and in which the three last-named mines are situated, is marcasite, which tends to spontaneous combustion, and is therefore difficult to ship.

Wisconsin.—The Wisconsin district does not produce any large tonnage of raw pyrite, but has an annual production of zinc-iron concentrates, which is shipped to zinc smelters in Illinois, and also a by-product containing about 28 per cent sulphur. This by-product during the last few years has been shipped to an acid plant. The ores in this district are treated as follows: They are crushed and are then given a "flash roast," which oxidizes a small percentage of the total sulphur, practically the volatile atom of sulphur in the pyrite, thereby making the iron sulphide, which remains, magnetic. The calcine is then treated under the magnet, and a high-zinc, low-iron concentrate and a magnetic iron sulphide tailing obtained. The companies that have shipped iron-sulphide tailings are the Vinegar Hill Mining Co., Cuba City, Wis.; the Wisconsin Zinc Co., New Diggings, Wis.; and the Mineral Point Zinc Co., Mineral Point, Wis.

Colorado.—Extensive deposits of pyrite have been developed in various mining districts of Colorado. The Leadville district alone, if properly equipped, could produce a daily output of at least 1,000 tons. The Colorado pyrite is used to some extent by the Western Chemical Manufacturing Co. at Denver, and during the war some small shipments were made to acid plants in Georgia. However, high freight rates have always prohibited general competition at points east of the Mississippi River. The Colorado ore is generally soft and granular; the lump ore decrepitates in the furnace, and therefore can be used only in fines burners.

California.—There are many large deposits of high-sulphur pyrite in California. The principal deposits of pyrite contain copper or gold, besides the sulphur, and the roasting operations from which the acid is made are preliminary to the smelting operations tions by which the valuable metals are recovered. The principal mines are:

1. Mine of Mountain Copper Co., near Keswick, Shasta County. This mine produces both lump and fines; the ore contains nearly 50 per cent sulphur, and is smelted for the copper and gold content.
2. Dairy Farm mine, in Placer County.
3. Mine of Leona Chemical Co., near Oakland, Alameda County.
4. Mine of Stauffer Chemical Co., near Oakland.

Other States.—Pyrite ores are found in various other States, but the amount produced primarily for acid manufacture is very small and need not be considered here.

CANADIAN PYRITE.

According to the available records, the mining of pyrite in Canada began in 1880, when ores were mined in the Sherbrooke district, Quebec, for exportation to the United States for the manufacture of acid.[a] With the exception of a few years (about the year 1890), until the year 1910 the production of pyrite in Canada was less than 50.000 long tons per year, of which approximately 30,000 tons was shipped into the United States. In the last seven years the production has increased rapidly from 80,000 tons in 1912 to about 300,000 tons in 1917. In 1917 the imports to the United States from Canada were about 180,000 tons, and in 1918 were nearly 225,000 tons. The sulphur content of the Canadian ores shipped during the last several years has been low, averaging not much higher than 37 per cent, though ores from certain districts contain about 40 per cent sulphur.

The following is a list of the companies operating pyrite mines in Canada during the last two years:

Eustis Mining Co., Eustis, Quebec. Office, 131 State Street, Boston, Mass.

Weedon Mining Co., Weedon, Quebec. Office, Portland, Me.

Nichols Chemical Co., of Canada, Sulphide, Ontario. Office: 25 Broad Street, New York, N. Y.

Southern Pyrites Co., North Pine, Ontario. Office: 25 Broad Street, New York, N. Y.

Algoma Steel Corp., Sault Ste. Marie, Ontario.

Canadian Sulphur Ore Co., Queënsboro, Ontario.

La Mine de Cuivre et Or., Stratford, Quebec.

Madoc Mining Co., Goudreau, Ontario. Office: 25 Broad Street, New York, N. Y.

Boyd Caldwell & Co., Lenark, Ontario.

Rand Consolidated Mines, Gondreau, Ontario. Office: 853 Ellicott Square, Buffalo, N. Y.

The pyrite production in Canada is almost wholly in the hands of United States organizations, and that produced by Canadian citizens is sold chiefly to United States organizations operating in Canada. The greater part of the Canadian export pyrite is not placed on sale in the United States, but is shipped directly to the acid plants owned by the organizations producing the pyrite.

There are unworked deposits in various parts of the country, notably those in the Goudreau mines area, 177 miles south of Sault Ste. Marie and about 40 miles from Michipicoten Harbor, on Lake Superior. The ores in this area will average not more than 35 per cent sulphur. The development and working of these deposits is largely a question of getting a market for the ores.

The ores from Quebec are used primarily in the New England acid plants; those from eastern Ontario in the Buffalo, Cleveland, and

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[a] Geol. Survey, Canada, Report for 1886, pt. 5, p. 61.

Pittsburgh districts; and those from northern Ontario in the Chicago district.

Canadian ore when sold on the market is sold usually on the basis of New York market quotations; and these, prior to 1917, were controlled by the price of Spanish ore. During the war the quotations were very irregular and were subject to considerable controversy.

PYRRHOTITE.

As pure pyrrhotite contains only 39.87 per cent sulphur, whereas pure pyrite contains 53 per cent, pyrrhotite ores formerly have not been considered suitable as a raw material for the manufacture of sulphuric acid. However, pyrrhotite has been utilized for that purpose for many years by the General Chemical Co. at its contact acid plant at Pulaski, Va. This is the only plant in the United States where such practice exists.

DEPOSITS.

There are enormous deposits of pyrrhotite in the eastern part of the United States, notably at the following places:

1. Deposit near Katahdin Iron Works, in Piscataquis County, Maine. This deposit was examined by E. S. Bastin, of the United States Geological Survey, in 1918, who reported that it is 2,300 feet long and 300 to 700 feet wide, containing on an average 100,000 long tons of ore for every foot of depth. The ore carries 26 to 35 per cent sulphur, less than 0.01 per cent phosphorous and less than 0.001 per cent arsenic. It is estimated that this ore may be laid down in New York City for about 13.5 cents per unit of sulphur.[a]

2. The Gossam mine of the General Chemical Co., at Monaret, Carroll County, in southwestern Virginia. This is the largest developed body of pyrrhotite in the East. The deposit itself can be traced continuously by its outcrop from New River, near Oldtown, northeastward beyond the Betty Baker mine for a distance of 18 miles. The ore is the raw material for the acid plant at Pulaski, and as fed into the roasters at that plant has practically the following analysis:

Analysis of pyrrhotite fed to roasters at Pulaski, Va.

	Per cent.		Per cent.
SiO_2	6.2	MgO	4.2
Fe	48.3	As	.06
Mn	.02	Zn	1.25
P	.03	Pb	.00
Al_2O_3	1.66	As	.007
CaO	1.56	S	30.3

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[a] News item, Large pyrrhotite deposits in Maine: Eng. and Min. Jour. vol. 104, Oct. 27, 1917, pp. 758–759.

3. Deposits of mixed pyrrhotite and pyrite in the Ducktown district in Southeastern Tennessee.[b] The principal developed properties are (1) the Burra Burra property, (2) the East Tennessee and Mary mines, (3) the Isabella Eureka property, and (4) the School Cherokee property. The Burra Burra deposit probably has 10,000,000 tons of ore carrying between 25 and 30 per cent sulphur. This deposit is being worked by the Tennessee Copper Co., the ore being smelted in a blast furnace and the gases utilized for the manufacture of sulphuric acid.

The ores of the East Tennessee mine and the Mary mine are smelted by the Ducktown Sulphur, Copper & Iron Co. at the smelter at Isabella, and the gases converted into sulphuric acid.

In the Isabella Eureka and the School Cherokee deposit, probably 5,000,000 tons, carrying about 29 per cent sulphur, have been blocked out.

BURNING.

As the pyrrhotite contains no free atom of sulphur, it can not be burned in lump burners, and is much more difficult to burn in a fines burner than is pyrite. In fact, it has been found that in order to burn pyrrhotite at all successfully in the ordinary types of fines burners the ore must be crushed to at least 30 mesh. Not only is pyrrhotite much more difficult to ignite, but it has such a low sulphur content that the heat of oxidation has to be conserved in order to carry on the process continuously. At the plant of the General Chemical Co., at Pulaski, the fines roasters are insulated on the outside of the shell with a magnesia-asbestos covering about 2½ to 3 inches thick, the purpose of this insulating covering being to cut down heat radiation and thereby maintain a high temperature in the roaster.

If the ore contains silica, lime, and other bases, there is a tendency at the temperatures which have to be maintained to start the pyrrhotite burning properly, for the ore to sinter or semifuse and thus cause trouble with the operation of the roaster.

On account of the large proportion of very fine ore which is necessarily present if the whole material is put through 30 mesh, the air can not work down into the charge and the oxidation is almost entirely a matter of surface combustion. For this reason the surface should be changed as rapidly as practicable by rabbling. This frequent rabbling also tends to keep the ore from sintering or semifusing.

It is difficult to reduce the sulphur content in the cinder to less than 4 per cent by the ordinary processes of burning, thus the actual number of available sulphur units in a ton of pyrrhotite is much smaller than in a pyrite ore. For example, in order to have the same number of sulphur units it would be necessary to handle 1.65 tons of a 30 per cent pyrrhotite as against 1 ton of a 45 per cent pyrite.

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[b] Taylor, J. H., Pyrite and pyrrhotite resources of Ducktown, Tenn.: Am. Inst. Min. Eng. Bull. 134, Feb., 1918, pp. 529–533.

In August, 1918, some tests were made at the plant of the Virginia Carolina Chemical Co., at Pinners Point, Va., to determine the feasibility of roasting pyrrhotite in its Hoffman fines burners. These tests were made by D. E. Fogg, of the Bureau of Mines, in cooperation with the staff of the company. The conclusion drawn from these tests was that pyrrhotite ore, when crushed to 30 mesh, can be successfully roasted in an ordinary type of multiple hearth roaster if enough brimstone (approximately 10 per cent) is added to preheat the ore in the top hearth to start ignition there, and if the roaster has some heat insulation to prevent high losses through the furnace walls.

PYRITE FROM COAL ("COAL BRASSES").

In certain districts through the eastern coal fields considerable quantities of iron pyrites occur as bands interbedded with the coal or as balls or nodules in the coal. In some places the bands are several inches thick, up to 5 inches, and are several square feet in area, or they may even form definite interbedded layers with the coal. The balls or segregations are decidedly irregular, both in size and in distribution. The pieces of pyrite as blasted or loosened with the coal in the mine generally have some coal attached, so that the "coal brasses," as they are discarded in the gob piles of the mine or on the dump at the surface, contain usually about one-half coal and one-half pyrite, by weight, and run only 25 per cent sulphur.

In the past, efforts have been made to clean the pyrite of the adhering coal by breaking off the coal with a hammer, the partly cleaned pyrite then being shipped to some acid plant. Such cleaning was inefficient when done by day labor underground and entailed much rehandling when done on the surface. On account of the fact that the product still contained considerable coal it was subject to spontaneous combustion and was therefore an undesirable product to ship. This adverse feature and the fact that acid produced from the partly cleaned brasses was apt to be contaminated with carbon driven off from the adhering coal and carried over into the chambers, tended to prevent the acid manufacturer from purchasing this material, especially so long as a purer pyrite could be obtained. Prior to the war the price received was even less than $2.50 per ton for material containing 38 to 40 per cent sulphur.

As a rule the hand-cleaned slabs or nodules of pyrite are shipped to the acid plant and allowed to weather for several months. The adhering coal slacks and if the entire product is then screened or crushed and screened, the coarse oversize is a fairly pure pyrite which does not disintegrate in the furnace, and which contains no arsenic and very little phosphorus. The Indiana and Illinois coal fields have irregularly shipped hand-picked pyrites to near-by acid plants, particularly to those near Chicago, Indianapolis, and Sandusky.

In Danville, Ill.[a] for several years a concentrating plant has been treating crude brasses collected from the local coal mines; the product shipped has been a pure pyrite of both lump and fine sizes, analyzing between 45 and 48 per cent sulphur. Some of this product was shipped as far east as Beaver Falls, Pa.

The annual production of pyrite or "coal brasses" from the coal fields of western Pennsylvania, Ohio, Indiana, and Illinois has been about 25,000 tons to 30,000 tons, most of which came from Illinois and was lump material. In 1918, a new plant was built at Gillespie, Ill., to treat about 200 tons daily of crude brasses collected from adjacent mines.

In 1917, when it became evident that there would be a heavier demand for sulphur bearing material than had existed prior to that time, considerable attention was given to the project of increasing the production of coal brasses. The first careful investigation as to the possible supply from the Illinois field was conducted by the Illinois geological survey. The results of this work were given in publications of the State geological survey, by E. A. Holbrook and J. E. Pogue, under dates of August 20 and October 18, 1917. Late in 1917 and in 1918, an investigation covering all the eastern coal-producing States was conducted by the Bureau of Mines, in cooperation with the State geological surveys of Pennsylvania, Ohio, Indiana, Illinois, West Virginia, Kentucky, Tennessee, Georgia, Michigan, and Missouri.

Not only were the most promising sources of supply determined, but tests were made with practically all the kinds of raw material to determine adaptability to concentration processes. The tests were made under the direction of E. A. Holbrook in the laboratories of the Bureau of Mines experiment station at the University of Illinois.

These investigations have shown that from the coal mines in the States mentioned, there may be produced a very large tonnage of pyrite.

The table following indicates the possible yearly production of pyrite from the mines that can easily produce 1 per cent or more of their coal production as coal pyrite:

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[a] For description of this plant see "The iron pyrite found in coal," by C. M. Young, Coal Age, vol. 11, Jan. 6, 1917, p. 9.

Possible yearly production of pyrite containing 40 per cent sulphur from coal mines of the eastern States.

State.	Long tons.
Indiana	260,000
Ohio	235,000
Illinois	225,000
Pennsylvania	200,000
Missouri	175,000
Iowa	140,000
Kansas	125,000
Tennessee	55,000
West Virginia	50,000
Kentucky	25,000
Michigan	10,000
Total	1,500,000

In mining coal this material is now usually separated from the coal and is thrown into the gob as waste. It can be loaded out without much difficulty and be either hand cleaned or treated by a properly designed and constructed concentrating mill from which two pyrite products, lump ore and fines assaying as high as 45 per cent sulphur and containing less than 5 per cent carbon, can be obtained. As a rule the mill will produce about one-half ton of pyrite and one-fourth ton of clean coal per ton of raw material treated. The average recovery of pyrite will be above 85 per cent. Concentration involves crushing, either by rolls or jaw crushers, screening through trommels, and jigging, which may or may not be followed by the use of Wilfley tables. A plant to treat 200 tons of crude material per day cost about $20,000 in 1918. The cost of operation in 1918 was about 80 cents per ton of raw material. The actual cost of the finished pyrite, of course, will vary with the cost of loading and delivery to the coal tipple, the cost of shipping the raw material to the cleaning plant, and with the grade of the raw material.

From the investigations made in 1918 it was evident that an outside concern going into the business of collecting crude coal brasses would have to pay practically the same price per ton as for coal at the surface. Whether this price for raw brasses will hold in the future is not certain. If the price does hold, of course, it will probably be difficult for an outside concern to produce a large tonnage of pyrite from coal brasses in competition with other sources of sulphur-bearing material, especially as the market for any large tonnage of the product is necessarily east of the Appalachian Mountains, involving considerable freight haulage. However, there is a possibility that the Central States will consume slightly more of the coal pyrite than was consumed prior to the war.

WASTE SULPHUR DIOXIDE GAS FROM ROASTING ZINC ORES.

The manufacture of acid as a by-product from the roasting of zinc blende in smelting zinc ores was introduced in this country about the year 1895, at the plants of the Matthieson & Hegeler Zinc Co., La Salle, Ill., and the Illinois Zinc Co., Peru, Ill. All of the zinc smelters in Illinois, Indiana, Ohio, Pennsylvania, and West Virginia where zinc sulphide ores are being roasted now produce acid as a by-product. There are 16 zinc plants producing by-product acid—12 by the chamber process and 4 by the contact process.

At these 16 plants the material roasted is usually a concentrate containing between 40 and 55 per cent zinc and between 25 and 32 per cent sulphur. The material is roasted in a special type of muffle furnace, described later, until the sulphur content is reduced as low as possible, usually about 1 per cent or less. In order to desulphurize the ore to this extent it is necessary to use external fuel, usually producer gas, this gas being burned out of contact with the ore.

At the zinc plants in Kansas, Missouri, and Oklahoma similar zinc ores and concentrates are being roasted, but until this year (1919) the manufacture of acid at these plants has not been undertaken. The plants were remote from the large markets at the time they were built, and as there was no necessity of utilizing the waste gases, the heavy investments required in the erection of acid plants were not made. If the zinc plants in this district were equipped with acid plants, the production of acid from zinc ores could be increased possibly by 60,000 tons (basis 100 per cent H_2SO_4) per year. One acid plant is now being built in this district.

Except for the fact that the content of sulphur dioxide is lower and more variable in the gases from the zinc-ore roasting furnaces than in the gases from pyrite or brimstone roasters, there is no special difference in the manufacture of the sulphuric acid. However, the lower, variable sulphur dioxide content makes the cost of manufacture higher.

There are also other plants where pyrite ores containing small quantities of zinc are being roasted, but these operations are being conducted primarily for the acid production rather than for the recovery of the zinc. These ores are generally roasted in ordinary fines burners.

WASTE SULPHUR DIOXIDE GASES FROM COPPER SMELTING.

The production of acid by utilizing the roaster gases at copper smelters involves practically nothing new from that of producing acid from ordinary fines pyrite. Usually the roasting must be conducted under more careful control, as regards the air admission, than where the copper ores are being roasted without the production of acid, for usually the concentration of SO_2 in smelter roaster gases is too low to use in the manufacture of acid. With care, the necessary concentration may be attained.

Sulphuric acid is being made in this manner as a by-product of copper smelting at the following plants:

Garfield smelter, Garfield Smelting Co., Garfield, Utah.

Washoe smelter, Anaconda Copper Mining Co., Anaconda, Mont.

Perth Amboy smelter, American Smelting & Refining Co., Perth Amboy, N. J.

Smelter of the Mountain Copper Co., Martinez, Calif.

Smelter of the Calumet & Arizona Mining Co., Douglas, Ariz.

The copper ores or concentrates at these plants usually carry about 30 to 35 per cent sulphur, although at the plant of the Mountain Copper Co. the ore runs nearly 50 per cent sulphur. As a rule, the sulphur content is reduced to not less than 8 per cent, which leaves sufficient sulphur for the subsequent smelting operations. No external firing is required to carry on the process of roasting these ores.

All of these plants are chamber plants, and with the exception of the production of the Mountain Copper Co., the acid is used largely for metallurgical operations being conducted by the producing companies. As has been stated above, the practice of producing acid by utilizing the gases from roasting copper ores could be greatly expanded in the western States, if there was a local market for the acid. Flotation concentrates, because of their extreme fineness and the tendency to make dust, usually are not as satisfactory for the making of acid as are the coarser products from other concentrating processes, or the crude, heavy sulphide ores.

Acid is being made from the waste gases from copper blast furnaces at only two plants in this country—the plant of the Tennessee Copper Co. and that of the Ducktown Sulphur, Copper & Iron Co., in the Ducktown district, southeastern Tennessee. As the result of an injunction obtained in 1905 by the State of Georgia against these copper companies imposing a restraint on the discharging of sulphurous gases into the atmosphere it was necessary for the companies to take active steps to utilize the waste gases. The operation of a sulphuric acid plant to utilize blast-furnace gases had never before been attempted as the project offered many serious difficulties; among them being the irregular supply of sulphur dioxide gas, variable temperature, large quantities of flue dust, and the large and variable quantities of carbon dioxide present. These difficulties have largely been eliminated or minimized, and acid has been produced in large quantities by the chamber process at these smelters since 1906. The largest plant is that of the Tennessee Copper Co., at

Copperhill, in 1918, this plant produced acid at the rate of about 1,000 tons (50° B. basis) per day. Further description of the practices at these plants appears elsewhere in this report.

SPENT OXIDE FROM GAS WORKS.

The amount of spent oxide from gas works available for acid manufacture is very small in comparison with the other raw materials. However, it may be well to mention this product.

Most works producing illuminating gas from coal purify their product from sulphurous acid by passing it through a mixture of ferric oxide and sawdust. As a result ferrous sulphide and sulphur are formed. On exposure to the air the ferrous sulphide is converted to ferric oxide with the formation of more free sulphur. Spent oxide runs as high as 60 per cent sulphur, and will average 40 to 50 per cent. However, the presence of lime renders part of this sulphur unavailable for acid making. The material is contaminated with ammonium salts and ferro and sulpho cyanides which would interfere with acid manufacture, causing an unduly high consumption of niter. These salts are usually washed out before the spent oxide is used.

Several schemes have been devised and plants erected for leaching the sulphur from the spent oxide by a hydrocarbon, such as benzol, or by carbon bisulphide, and then boiling off the volatile solvent, leaving behind the sulphur with any tars which might be dissolved also.

The product obtained has been 90 to 92 per cent sulphur, the rest being tarry material. This product would not be a desirable material for the manufacture of acid in normal times, but a small tonnage was produced and sold to acid manufacturers during the war.

EQUIPMENT AND METHODS USED IN MANUFACTURE.

The types of equipment used and the processes employed in the manufacture of sulphuric acid in this country are discussed in the following pages.

BURNERS OR ROASTERS.

GENERAL FUNCTION OF BURNERS.

At all sulphuric acid plants, except those where the acid is made as a by-product in copper or zinc smelting, the burners or roasting furnaces are used solely for producing sulphur dioxide gas. Their function is to produce a steady supply of that gas at as nearly constant a concentration as possible and, at the same time, to effect as complete oxidation of the sulphur in the ore as may be possible. The more nearly these two objects are accomplished with a minimum cost for labor and repairs, the more perfect is the burner and its operation.

The production of a steady stream of gas of constant composition is of the greatest importance to the manufacturer of the acid, whether the material being burned is pyrite or brimstone. Inasmuch as nearly all the troubles experienced in acid making come from fluctuations in the sulphur dioxide content of the furnace gases, the more nearly a constant and uniform gas composition can be approached the more nearly will the acid manufacturing process be uniform, and thus become almost mechanical.

Next in importance to the consideration of constancy and regularity of gas volumes and composition is the actual percentage of sulphur dioxide in the gases.

Experience has shown that with pyrite the best results, both in the roasting furnace and in the chamber plant, or in the contact plant, are obtained when the gases leaving the burners contain 7.0 to 7.5 per cent sulphur dioxide. With certain ores this percentage can be somewhat increased with satisfactory results. When burning brimstone, the gases should contain 8.5 to 9 per cent sulphur dioxide.

Often when sulphur dioxide gas is produced as a metallurgical by-product it is not possible to obtain these conditions, either as to constancy of volume and composition or the content of sulphur dioxide present. In very few instances, however, is it necessary that the metallurgical gas shall contain as low as 4 per cent SO_2, and usually the gas will contain 5 to 6 per cent SO_2. Where the sulphur dioxide concentration is lower, it is usually possible, and occasionally commercially practicable, to enrich and steady the gas by burning a rich pyrite ore or brimstone either admixed with the ore or in a separate auxiliary furnace.

In order to maintain the desired regularity of volume and composition of the burner gases it is necessary to insure a uniform supply of ore, and also of air to the furnaces.

REGULATION OF ORE SUPPLY.

In the mechanical furnaces, such as the fines burners or special brimstone burners, a uniform supply of ore is effected by means of an automatic mechanical feed. In the use of hand-worked furnaces, usually a series of such furnaces are charged and discharged at regular intervals so that the average of the gas coming from the series remains practically constant.

Not only is it necessary to regulate the supply of ore, but it is also necessary to have the ore properly sized, and of fairly uniform physical condition. Especially in the operation of lump burners, it is desirable to have ore of uniform size, free from fines or lump above the size for which the furnace grates are set. The burning of the sulphur in lump pyrite is in many ways analogous to the burning of carbon in anthracite. Just as an indiscriminate mixture of all sizes of anthracite, from culm and pea to nut size, can not be burned satisfactorily and evenly, even with care in stoking, no more successfully can pyrite ore of variable size be burned. The spacing of the grate bars in lump burners is also of great importance, as these should be spaced to suit the size of the ore being roasted. The more closely the ore is sized, and the more carefully the grate-bar spacings are adjusted to suit the sizes of the ore, the more uniformly will the roasting proceed, with consequent beneficial effect in the acid plant.

One of the most serious results of trying to roast improperly sized ore in a lump burner is clinkering. In a kiln filled with ore sized with reasonable care, the air comes in contact with all the pieces of ore to about the same extent, and the combustion takes place regularly. However, when the ore contains a considerable proportion of smaller pieces, or fines, there will be some points where the air can not pass. At the temperature of the kiln the sulphur in the particles of pyrite shut off from the air will partly sublime, and the FeS_2 will be converted into FeS, or a fusible matte. This matte will become slightly fused or melted and cause the formation of a clinker. This not only causes the sulphur to be retained in the cinder, but also tends to cause fluctuation in the gas concentration.

REGULATION OF AIR SUPPLY.

With a given type of ore and a constant rate of feed the supply of air should be regulated to within fairly narrow limits in order to realize the best results. Not only should the quantity of air admitted to the furnace be carefully regulated, but there should also be control over the points of admission. In a fines burner, for example, an adequate amount of air should be admitted at the point in the furnace where the most active combustion is taking place, but air should not be permitted to sweep over the cinder after the sulphur content has been reduced to 3½ or 4 per cent, at which stage an excess of air simply serves to cool the ore below its combustion point, and thereby prevents the complete oxidation of the sulphur.

In intermittently charged and hand-worked furnaces the air supply should be regulated in accordance with the sulphur content of the ore in each individual furnace. In a large fuel bed too free a supply of air produces too high a temperature, causing the pyrite to fuse and clinker, a result precisely similar to that attendant upon insufficient air in localized spots.

Because of the importance of a regular air supply, the burners or roaster furnaces are preferably operated on a positive draft induced primarily by a fan placed in the flue system. In chamber plants the fan is usually between the furnaces and the Glover tower, or between the Glover tower and the chambers, and in contact plants, before the scrubbers. By means of the fan it is possible to adjust instantaneously the draft on the furnaces to meet any required conditions, such as variations in the quantity or character of the ore charged.

BRIMSTONE BURNERS.

In burning brimstone for the manufacture of sulphuric acid it is not only necessary to maintain a gas of sufficient richness in sulphur dioxide, but also to prevent sulphur from being volatilized and carried over into the acid plant. Thus the necessity for a positive control of the draft, and a well-regulated control of the feed, is evident.

PAN BURNERS.

The simplest form of sulphur burner is, of course, the pan burner, consisting of a flat-bottomed cast-iron pan covered with a cast-iron or brick arch to form a chamber. Various constructions of this type of furnace are used and produce good results, hence it is hardly necessary to describe them in detail. The pans vary in size from 3 inches to 7 inches deep, 3 feet to 4 feet wide, and 6 feet to 8 feet long. The bottom of the pan is usually slightly dished or inclined, so that the molten sulphur will collect in a pool nearer the forward end. At one end of the furnace is provided a charging door, hinged at the top. At the other end of the furnace is a connection to the flue. Air is admitted to the furnace through the forward end by keeping the edge of the door slightly raised by means of hand screws.

Provision is generally made for a preliminary heating of the iron pan, and when the furnace becomes hot enough to melt sulphur the sulphur is thrown in and ignited. From then on, the heat generated by the burning of the sulphur melts the fresh sulphur that is thrown in, the molten sulphur spreading over the pan and igniting.

Intermittent feeding of the sulphur in this type of furnace permits a quantity of cool air to be admitted to the furnace, cooling the furnace temporarily and diluting the gases. Therefore various schemes are employed to feed the furnaces through the top arch continuously, or if several furnaces are being operated in a battery, the furnaces are fed in regular order at stated intervals, so that the average gas from the battery will be of reasonably constant strength.

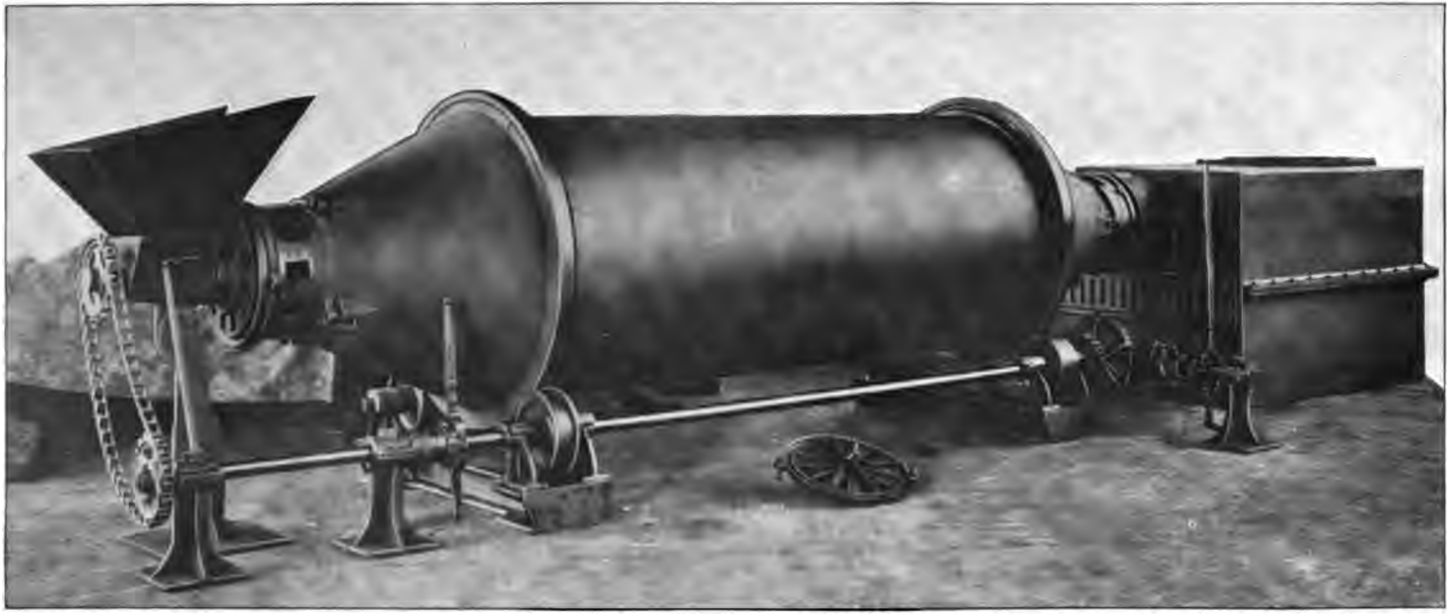
When the sulphur is fed in continuously it is usually first shoveled into a hopper placed near the forward end of the furnace and so constructed that sufficient heat is radiated or conducted from the furnace to melt the sulphur in the bottom of the feed hopper. The melted sulphur can then be discharged into the burner through a spout or pipe, the flow being regulated by means of a valve.

Frequently the pan burners are built with two hearths; the sulphur is thrown or fed into the upper hearth, where it is melted by the heat from the lower hearth and then drops into the lower hearth, where it is burned. Most of the air is admitted to the lower chamber, but provision is also made for admitting more air, if necessary, to the upper chamber for the complete combustion of the sulphur vapors.

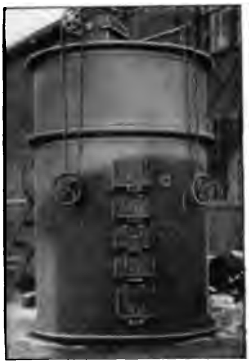
The capacity of a pan furnace is about 1.5 pounds of sulphur per square foot per hour. Thus a large floor space is required for a full installation of pan furnaces. Generally furnaces of this type are used in this country only in emergencies or for short periods, or when it is desired to "boost" the sulphur dioxide content of the gases coming from an ore-roasting furnace.

ROTARY AND VERTICAL BURNERS.

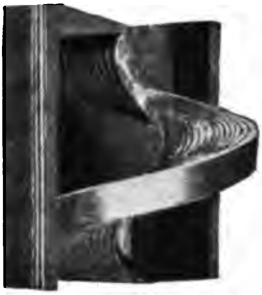
At many plants where brimstone is burned regularly or in large amounts the burner employed is either a horizontal rotary cylinder, such as the Tromblee & Paul burner, or the stationary vertical cylindrical shell containing a series of shelves, such as the Vesuvius burner.



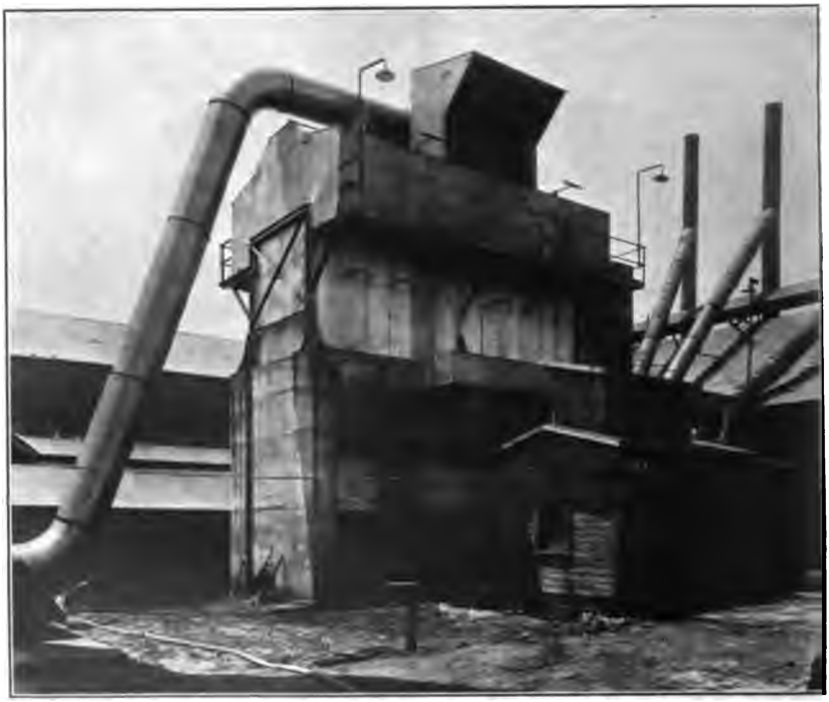
TROMBLEE & PAUL SULPHUR BURNER.



A. VESUVIUS SULPHUR BURNER.



B. SPECIAL RING PACKING.



C. COTTRELL PRECIPITATOR FOR REMOVING DUST AND FUME FROM THREE ROTARY KILNS ROASTING ZINC ORES (BY COURTESY OF RESEARCH CORPORATION).

TROMBLEE & PAUL ROTARY BURNER.

The Tromblee & Paul rotary sulphur burner (Pl. I) is built by the Glens Falls Machine Works, Glens Falls, N. Y. The burner comprises a horizontal, cylindrical flange steel shell, ranging in size from 14 inches in diameter and 2½ feet in length to 48 inches in diameter and 16 feet in length. The ends of the shell are cast iron and are cone shaped. At one end is a hopper and worm feed with sliding dampers. The other end connects with a rectangular cast-iron box, known as the combustion chamber, which is provided with a partition and a vertical cast-iron uptake pipe leading to the flues and to the acid plant. Frequently the combustion chambers are vertical, circular steel tanks with a center baffle wall. The combustion chambers are lined with fire brick. The flanges at the ends of the cylinder form the bearings, which run on rollers or trunnions.

The "standard" size of this burner has a shell 36 inches in diameter and 8 feet long and burns about 250 pounds of sulphur per hour.

The sulphur is fed to the furnace by means of the mechanical worm feed. Before feeding to the hopper, the sulphur needs no other preparation than breaking up the large lumps. When forced along by the worm, the sulphur melts just before it drops into the body of the burner. A bed of burning or boiling sulphur rests in the bottom of the shell. The shell, revolving at the rate of about one-half revolution per minute, performs the function of an agitator, maintaining over its whole inner surface a constantly renewed film of pure sulphur, the surface of which burns intensely. That part of the film underneath the flaming surface protects the shell from deterioration, as sulphur is a very poor conductor of heat.

By a proper adjustment of the dampers on the front end of the burner, perfect combustion may be obtained, and there should be no sublimation of the sulphur. In practice, however, especially where gas of high sulphur dioxide content is being obtained, complete combustion does not always take place in the revolving cylinder, and a certain proportion of the sulphur is volatilized and carried over with the gases into the combustion chamber. Through air tubes, extending into the sleeve connecting the cylindrical burner with the combustion chamber, additional air is admitted for combustion of the volatilized sulphur. Air is also admitted through a space between the burner head and the sleeve, the space being regulated by an adjustable ring.

With this type of burner, control of the composition of the gas between the limits of 4 per cent and 16 per cent sulphur dioxide is a comparatively easy matter, because the feed is continuous and under perfect control, and by proper regulation of air perfect combustion can be obtained. With Louisiana or Texas brimstone the burner has to be cleaned only about once a month. To do this, or to prepare for a shutdown for repairs in any part of the plant, the sulphur charge is allowed to burn out completely, and any residue in the cylinder is then easily removed with a hoe.

The cost of operation is low, as one man can take care of several furnaces. The cost is usually less than 50 cents per ton.

VESUVIUS VERTICAL BURNER.

The Vesuvius burner (see Pl. II, *A*) is constructed by the Valley Iron Works Co., Appleton, Wis. This furnace is of the round vertical type, the top of which forms a dome called the "cupola." On top of the dome and partly within the burner is a melting kettle. The shell of the burner is of iron and steel, and is lined with fire brick. The inside of the burner is provided with a number of dish-shaped iron trays or shelves. For each shelf and the bottom compartment a door is provided for regulating the admission of air and for cleaning.

The sulphur is placed in the melting pot at the top of the furnace, where it melts and drips through a needle-point valve in the bottom of the melting pot onto the top tray or shelf. From the top shelf the sulphur drips onto the next lower shelf, then flows across that shelf and drips onto the third, continuing to flow back and forth and drop from shelf to shelf until it enters the bottom chamber of the burner, where the ashes and impurities collect. The following procedure has been found to be satisfactory for maintaining a pool of sulphur on all the shelves and giving a constant gas concentration: The needle valve is opened and the molten sulphur allowed to rush down until it overflows the bottom tray and flows into the bottom; then the needle valve is closed. The operation is repeated at intervals, depending upon the action of the burner. In case a smaller amount of sulphur is required to be burned, say five tons in a nine-ton burner, the same procedure is followed, except that the needle valve is closed when the sulphur commences to flow on one of the shelves higher up, say the third shelf.

The gas outlet consists of two parts—the first part is an elbow extending about 4½ inches into the burner, this extension forming an arch for the brick lining; the second part is a round iron pipe, oblong shaped on one end to conform with the shape of the elbow, the upper end being slotted and serving as a combustion chamber. Around the slotted pipe, resting on projecting rings, is a circular damper which regulates the admission of air so that any sulphur carried out of the furnace proper as volatilized sulphur will be completely burned in the combustion chamber. With proper regulation of the admission of air onto the shelves and the admission of air to the combustion chamber there should be no loss of sulphur even when a gas of very high sulphur dioxide concentration is obtained.

With a good grade of brimstone, the Vesuvius burner requires cleaning only once in about two weeks, the operation requiring about two hours.

One of the possible advantages of the Vesuvius type burner over the rotary type burner is that the former, being vertical, requires less floor space. A Vesuvius burner having a capacity of nine tons per day requires about 72 square feet of floor area. A rotary burner of the same capacity requires about 300 square feet. The Vesuvius type burner requires no power and thus no expense for oil, belt, or chain. On the other hand, the feed to the vertical type is not continuous, and some difficulty has been experienced in keeping the feed open, as sediment gets into the needle valve, clogging it. Both furnaces require about the same amount of labor or attention to operate.

LUMP BURNERS.

Lump burners are nothing more than the simplest form of a deep-bed coal fireplace. They are rectangular in horizontal section, varying in area from about 18 to 36 square feet, the usual width being 5 feet and the depth from front to back 4 to 6 feet. The burners are usually erected in batteries of 16 to 32 furnaces, the units being arranged in two rows, back to back, with a common central wall. By this arrangement is realized the maximum economy of space, material, and first cost, and the heat losses are reduced to a minimum. There are many different types of furnaces in use, but the following general statements will cover the description of burners of modern construction.

The batteries of furnaces are usually built of brick, common brick being used for the lower part and for the outer walls, and fire brick being used for the inside walls above the grates, for the arches, and for the gas flues. The front walls are usually one tier of brick 4½ inches thick, and are faced with cast-iron plates, one for each unit in the battery, each plate being provided with the necessary openings for operating the furnace.

The center wall between each pair of furnaces is usually two bricks (nine inches) thick, and the side walls between adjacent burners are two bricks thick to a little above the level of the gate, and above that is one brick thick. The end walls of the battery are usually about 18 inches thick, and are faced with solid plates.

The whole battery of furnaces is bound together by vertical buckstays, steel rails, or I beams, held together by horizontal tie-rods which are provided with turnbuckles to permit adjusting the tension to suit the condition of the furnace.

The interior of each unit is divided into two parts by the grate bars. The cinder pit below the grate bars varies from 18 inches to 24 inches in height. The height of the abutments of the arch above the grate bars is about 42 inches, and the spring of the arch is between 8 inches and 10 inches. In some batteries the arch is sprung from side to side over each furnace, on others an arch is sprung from each front wall to the median wall, thus running lengthwise of the furnaces.

The grate bars are usually made of 1½-inch or 2-inch square iron resting on cast-iron bearing bars. Bearings are turned on the grate bars, the diameter of the bearing cylinders being that of the bar. The ends of the bars projecting beyond the first bearing are left square and a key is provided for shaking and turning. The grate bars are spaced 4 inches center to center, usually with the diagonal of the square section horizontal, making an opening between the bars 1.17 inches wide.

To remove part of the cinder it is only necessary to turn the grate bars slightly, one at a time by the key, which is adjusted over the square end. The movement momentarily enlarges the opening between the bars, and forces downward between the bars the cinder lying immediately adjacent to the grate. The whole bed of pyrite above is more or less shakened, or loosened by the grate movement.

The cast-iron fronts of the furnace units are provided with suitable openings for charging the furnace, removing the cinder, and fitting the key on the ends of the grate bars, and gaining access to the flue. Occasionally a poke hole is also provided. The sill of the charging doors is placed about 30 inches above the grate bars, the height of the door varying between 20 inches and 30 inches.

The gas flue is usually built on top of the furnace, the upper part of this being made by a second arch rising 8 inches to 12 inches above the furnace arch, and running the length of the battery. A small opening admits the gases into the flue from the furnace.

In the construction of any type of furnace care must be taken to make all flues or openings into the flues perfectly tight, because all air admitted to the burner or flues, except when it will aid combustion and will be under complete control, is of great detriment.

In most furnaces the doors run in grooves, but in some they are hinged to lugs cast on the plates. When doors run in grooves their faces are inclined, carefully planed, and are pressed by gravity or latch against the planed edges of the door jamb, making a gas-tight joint and rendering the use of luting unnecessary.

Usually the ash-pit, or cinder-pit, door is perforated with 1-inch holes, which can be plugged to regulate the admission of air below the grates.

In lump burners of modern construction the capacity of a single furnace is about 1.8 pounds of 45 per cent sulphur ore per square foot of grate per hour. The charge is thrown in intermittently by hand through the charging door, and distributed as quickly as possible over the surface of the fire bed. To get the most steady gas volume and concentration, and the most complete desulphurization of the ore, it is necessary that the size of the ore pieces and the spacing of the grate bars should be properly regulated. The shaking of the grate bars is done by hand. Alternate bars across the burners are generally shaken, and the intermediate bars are shaken at the next period with such additional treatment as is required to bring down the cinder evenly. The cinder is generally allowed to accumulate in the ash pit, and is removed once every 24 hours.

The depth of the bed maintained on the grates largely depends on the draft conditions and the size of the ore pieces; it varies up to 2½ feet. No red-hot cinder should ever come through the grate bars; in fact, with a proper regulation of the depth of fuel bed, the cinder when shaken down should be fairly cool.

The average cost of roasting ore in a lump burner at a plant roasting over 30 tons of ore per day is about $1 per ton.

FINES BURNERS.

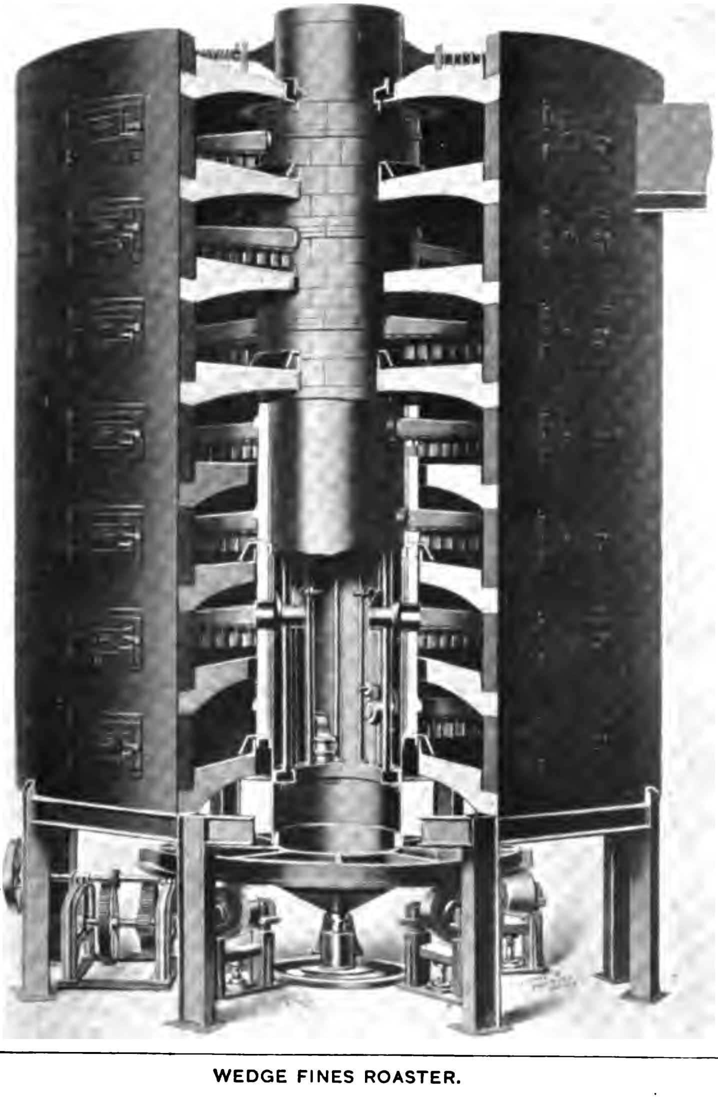
For the burning of fines ores the cylindrical multiple-hearth furnace of the so-called McDougal type is generally employed in this country. Various modifications of the multiple-hearth furnace have been evolved and patented. Those most commonly used are the Wedge and the Herreshof furnaces. The Skinner furnace and the Hofman furnace are also employed in several plants, these furnaces differing from the Wedge and Herreshof furnaces only in certain details.

Described briefly, this type of furnace has a vertical cylindrical steel-shell lined with common brick or fire brick and contains a series of horizontal or slightly arched brick hearths. In the center of the furnace is a vertical revolving hollow shaft to which are attached removable cast-iron arms carrying replaceable rabbles, these arms revolving over the hearths and rabbling and pushing forward the ore on the hearth. The rabble arms and center column are cooled by air or water. The ore is fed mechanically onto the top hearth at the circumference, from whence it is pushed by the rabbles to the center, then drops onto the hearth below, where it is turned over repeatedly by another set of rabbles placed at such an angle that the ore is gradually pushed to the circumference to drop through a slot onto the third hearth, continuing in this manner through the furnace until discharged from the bottom hearth into a hopper below the furnace. The rabbles are so arranged in regard to their pitch and progression that a moving layer of ore, in a uniform system of furrows, equal in depth from the center to the circumference is maintained on all hearths. The air for combustion either enters cold through adjustable openings in the doors, or through slots in the rabble arms, or through special pipes or connections.

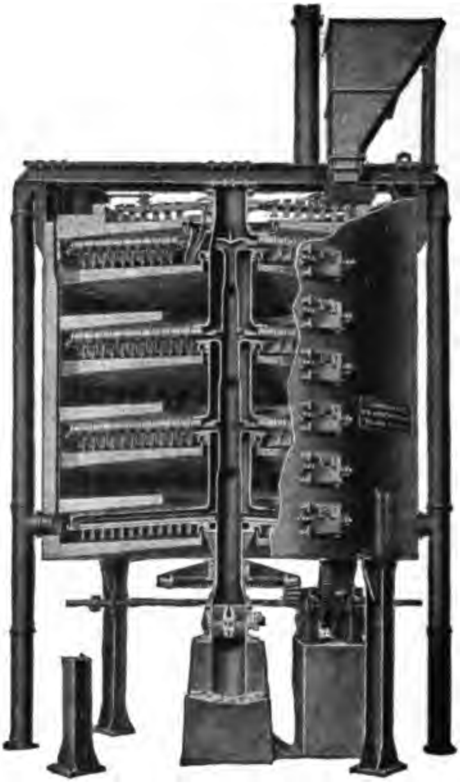
When ores containing 30 per cent or more sulphur are roasted the heat from the burning of the sulphur and the oxidation of the iron is sufficient to carry on the process continuously; the hot gases rising from the hearths, where the oxidation is the most rapid, serve to heat up and start the ignition of the fresh ore descending through the furnace. In fact, with ores containing more than 40 per cent sulphur the temperature of the furnace is apt to become too high at certain hearths, tending to cause fusion of the ore and deterioration of the metal part exposed to the heat. Various means have been devised for controlling the temperature on the hearth, involving the cooling of the rabble arms with water or air, providing outlets direct to the flue for a portion of the gases at various hearths, and regulation of the air admitted to the hearths.

One of the principal problems in roasting high-sulphur ores is to keep the main shaft and the rabble arms at a temperature where the metal is kept cool and is not deteriorated. The common practice has been to circulate water through the shaft or arms. This water removes a certain amount of heat from the hearths and thus partly serves to cool them. However, the salts in the cooling water tend to form incrustations in the arms and columns, and, primarily for this reason, there has been a development of air-cooling systems. In these systems air is forced at a pressure of 1 to 3 ounces by means of a fan into the arms or into the main shaft and arms; thence the heated air is discharged directly into the furnace or allowed to escape to the atmosphere, or all or part of the heated air is conducted to certain hearths of the furnace to aid combustion there.

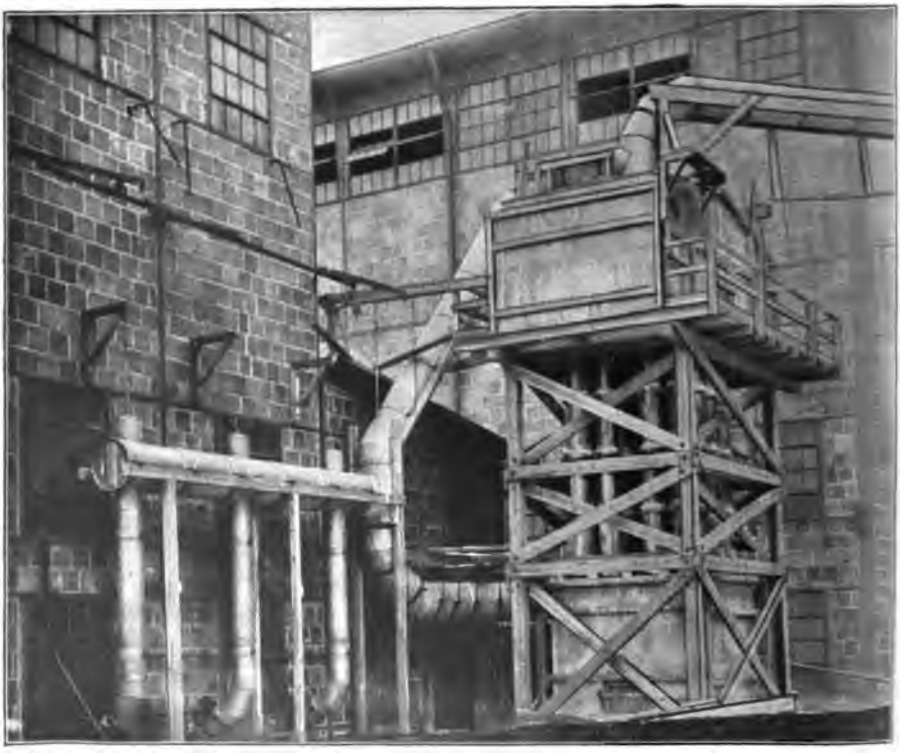
With a well-constructed and well-insulated furnace, equipped with temperature control and under proper care in the regulation of the air supply, etc., it is possible to roast ores containing less than 30 per cent—even as low as 25 per cent—available sulphur to a cinder containing less than 4 per cent of the sulphur, and obtain at the same time a satisfactorily high content of sulphur dioxide in the gases. However, there are very few acid plants in this country where this is being done successfully and as a regular procedure. The most



WEDGE FINES ROASTER.



A. HERRESHOF FURNACE.



B. ELECTRICAL PRECIPITATOR FOR REMOVING ACID MIST FROM THREE SULPHURIC ACID CONCENTRATORS PRODUCING A TOTAL OF 50 TONS OF 66° B. ACID IN 24 HOURS.

(By courtesy of the Research Corporation.)

notable example is at the plant of the General Chemical Co., at Pulaski, Va., where a pyrrhotite ore containing only about 30 per cent total, or less than 25 per cent available, sulphur is being treated in well-insulated Herreshof furnaces.

Mechanically the operation of a fines burner is extremely simple, consisting of feeding the ore regularly and controlling the admission of air to the various hearths to obtain the proper temperature and gas concentration. Regulation of the speed of the furnace to meet the conditions of the ore is also necessary to obtain the desired results.

Oxidation is partly effected when the ore drops from hearth to hearth through an ascending current of heated gases containing oxygen. The rate of oxidation during this period of falling could be largely increased by increasing the velocity of the gases through the openings, but it is necessary to keep the gases at a fairly low velocity to prevent the raising and carrying away of very fine dust particles.

No accurate statement as to the capacities of furnaces in pounds of sulphur or tons of pyrite per 24 hours can be made without a knowledge of the chemical composition or physical character of the ore to be roasted. In general, these furnaces will oxidize 0.5 to 1.0 pounds of sulphur per hour per square foot of hearth area from pyrite ore 40 per cent or higher in sulphur, to 2.5 or 3 per cent sulphur in the calcine.

WEDGE ROASTER.

The Wedge fines roaster (Pl. III and fig. 2) is built by the Wedge Mechanical Furnace Co., of Philadelphia, under patents controlled by it. One of the distinctive features of the Wedge roaster is the large central vertical shaft, which is 5 feet in diameter. This shaft is constructed of ½-inch steel plate, protected by special fire tile which are attached to and revolve with the shaft. This central shaft, together with the master gears, is carried by six large rollers and their supports, and is revolved by pinion and train of gears and pulley. The removable arms are connected with the main shaft in such a manner that they lock on the inside of the shaft, thus allowing the removal and replacement of an arm without appreciably cooling the inside of the furnace, as workmen can work in the shaft even when the furnace is hot. This large column also permits of independent air or water supply pipes with valve control to each arm or a combination of arms as desired. When air is used for cooling, if the ore does not contain enough sulphur to burn satisfactorily or rapidly, it is possible to assist the "heat balance" of the furnace by discharging the hot air from the arms directly into the furnace through slots in the arms. Furthermore, as it is not necessary to cool the central shaft, there is no local cooling in the center of the furnace as would be incident to the presence of a cooled shaft there.

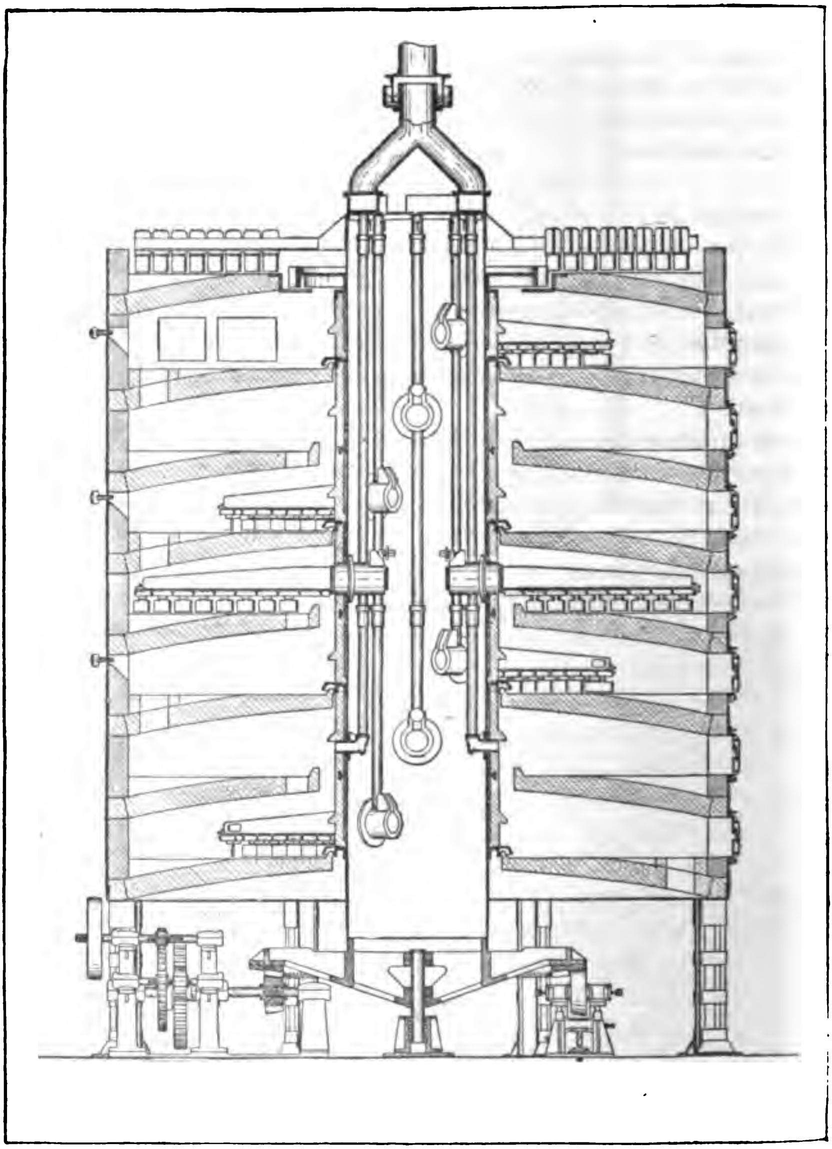


FIGURE 2.—Section through Wedge fines burner.

The rabble arms and blades are the only iron parts exposed to the heat and furnace gases, as the center column is protected by a special tile and a special type of brick.

The Wedge furnaces are built in various sizes ranging from 16 to 25 feet in diameter, and with various numbers of hearths, so that it is possible to obtain the desired hearth area in the smallest number of units. A furnace designed to roast the ordinary pyrite ore containing 35 per cent or more available sulphur does not need special description, as these furnaces are standard in design and construction. The ordinary 20-foot seven-hearth furnace with top drier hearth can be relied on to burn about 50 to 60 tons of pyrite per day when roasting ore carrying 45 per cent or more sulphur to 2 to 4 per cent in the calcine, and to deliver a gas carrying about 7.5 per cent sulphur.

Various modifications of construction are possible to meet special conditions of ores and of results desired.

It may be of interest to note the type of construction recommended by the Wedge Furnace Co. for a furnace to roast an ore containing less than 30 per cent available sulphur. For a daily capacity of 33 tons of such ore, a 25-foot diameter furnace is recommended having seven roasting hearths and a drier hearth. Part of the rabble arms are water-cooled and part are air-cooled. The air, delivered by a fan, enters the furnace at the top of the central shaft and through six 4-inch pipes enters six arms in the upper part of the furnace. The heated air from these six arms is then introduced into six arms in the lower part of the furnace, two arms being in tandem. From these lower air-cooled arms the heated air is permitted to enter the three lower hearths through openings in the outer ends of the arms. The fourth and hottest hearth has water-cooled arms, the water being supplied by gravity from a water pan at the top of the central shaft, which also acts as a lute for the air coming from the fan.

In order to conserve as much as possible the limited amount of heat units generated by the burning of the ore, the outer walls of the four upper hearths have a thickness of 2½ inches of an insulating material, such as "nonpareil" brick or "silocel" brick. The three lower hearths, where the smallest amount of heat is generated, have a thickness of 5 inches of insulating material.

The central shaft is insulated by 4 inches of special tile and 2½ inches of nonpareil brick.

The bottom hearth is supported by a $\frac{3}{16}$-inch steel-plate floor and I beams, which also support the water lute at the bottom of the central shaft. The bottom hearth is also insulated with nonpareil brick.

HERRESHOF FURNACE.

The Herreshof furnace was developed by the General Chemical Co. through its Herreshof furnace department. The latest pressure air-cooled furnace (Pl. IV, *A*, p. 67) was developed only during the last five years. In this type of furnace the center vertical shaft is made double, the outer shaft or tube being of cast iron and the inner tube also of cast iron or of steel. The rabble arms are also made with this double effect, the inside tube of the arm connecting with the inside tube of the shaft, while the outside tube of the arm connects with the outside tube of the shaft. The air supplied by the fan enters the inner tube of the shaft, passes through the inner tube of the arm, thence through the outside arm and shaft tubes to the top of the furnace. Here it is either discharged to the open air or is carried to the bottom or cooler parts of the furnace for combustion, either through temperature-control flues or the bustle pipe, or both.

The temperature-control flues transmit the excess heat from the hottest zones of the furnace to the cooler zones.

Damper control in the waste-heat bustle pipe and in the control flues makes possible the use of as much or as little of the waste heat as is desired. This flexible control makes the furnace adaptable for burning various grades and quantities of ore within reasonable limits. The Herreshof furnace is built in four sizes, the smallest being 11 feet 7½ inches in diameter, the next larger 15 feet 9¾ inches in diameter, the third 20 feet in diameter, and the largest 21 feet 6 inches in diameter, with either five or seven hearths. The smallest size (five-hearth) furnace will roast about 5 tons and the largest as much as 70 tons a day of pyrite from an initial sulphur content of 45 per cent to a final content of 2.5 to 3 per cent.

The cost of roasting in a fines burner varies between $0.50 and $1.50 per ton, depending largely upon the size of the plant and the equipment for handling the ore mechanically. During the year 1918 an average cost was about $1 per ton.

ZINC-ORE ROASTERS.

Zinc blende is roasted primarily to prepare that material for subsequent metallurgical treatment by which the zinc is reduced to the metallic state. As the first consideration in the roasting of blende is to get as complete desulphurization of the material as possible, the production of sulphuric acid from the roaster gases is ordinarily a by-product operation and of special consideration.

Zinc blende as handled at the zinc plant ordinarily contains about 25 to 30 per cent sulphur. Under proper conditions a nearly complete roast of an average blende can be obtained, and one of the conditions necessary is to raise the temperature of the ore to between 700° and 800° C. in contact with sufficient oxygen. Theoretically sufficient heat can be obtained by the oxidation of the sulphur and metal, provided the gases leaving the furnace contain at least 5 per cent sulphur dioxide, to carry on the process without external fuel. However, no furnace has yet been constructed to utilize fully the heat of combustion of the ore, and it has been necessary to apply external heat.

The fuel requirements figured to bituminous coal vary between 8 and 35 per cent of the ore roasted. For certain districts, namely, in the Kansas, Oklahoma, and Arkansas zinc districts, the ores are roasted in single-hearth reverberating type furnaces, such as the Ropp or Zellweger furnaces, where the products of combustion of the burning fuel come in direct contact with the ore and thus dilute the sulphur dioxide in the gases leaving the furnace to a point so low that it is not feasible to make acid therefrom. These furnaces are much cheaper to construct than the muffle type, and can be operated much more economically, especially with natural gas, which is available in the district where these roasters are used.

HEGELER TYPE FURNACES.

Where sulphuric acid is to be made from the waste gases the ore is roasted in a muffle type of furnace, of which type the Hegeler furnace is the most commonly used in this country. The term Hegeler furnace does not imply a furnace of a certain definite structure; it refers only to a very general type. The original Hegeler patent (U. S. patent No. 303671) was applied for in 1882, and at present almost every Hegeler furnace has been built differently. There are now several different systems of firing, and several systems of air regulating, besides a great many different designs of minor features. For a detailed description of the Hegeler furnace and the method of operation in order to get the metallurgical results desired, the reader is referred to the book by Ingalls.[a]

Hegeler furnaces have seven hearths, the three lower being heated with producer gas (see fig. 3).

The hearths, with muffles, are arranged on each side of the center wall, the concentrate being fed in at opposite ends of the two top hearths and discharged at the two opposite ends of the bottom hearth. The passage of the blende over the hearth is effected by means of a rabbling mechanism. Rabbling is commenced at the top hearth, the charge being moved from the feed toward the discharge end, where it is dropped through a slot in the floor of the hearth upon the hearth below. It is then drawn by another rabble toward the opposite end, where it is again dropped through another slot to the next lower hearth, and so on until discharged from the lowest hearth. The rabble used is a rake type designed to turn over, plow, and move the charge forward through the furnace. The rabbles are supported at the end of the furnace on a stand, which may be moved from one side to the other for rabbling each of the two hearths on each level.

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[a] Ingalls, W. R., Metallurgy of zinc and cadmium, 1903, p. 145.

The rakes are drawn through the furnace by means of detachable rods.

The gas travels in the opposite direction; it is admitted to the lowest fire muffle at one end and passes to the other end, being partly burned by the admission of air at intervals. The gas then passes outside of this muffle, and is admitted through a by-pass to the next muffle above, where it is further burned, the combustion being finally completed under the third muffle.

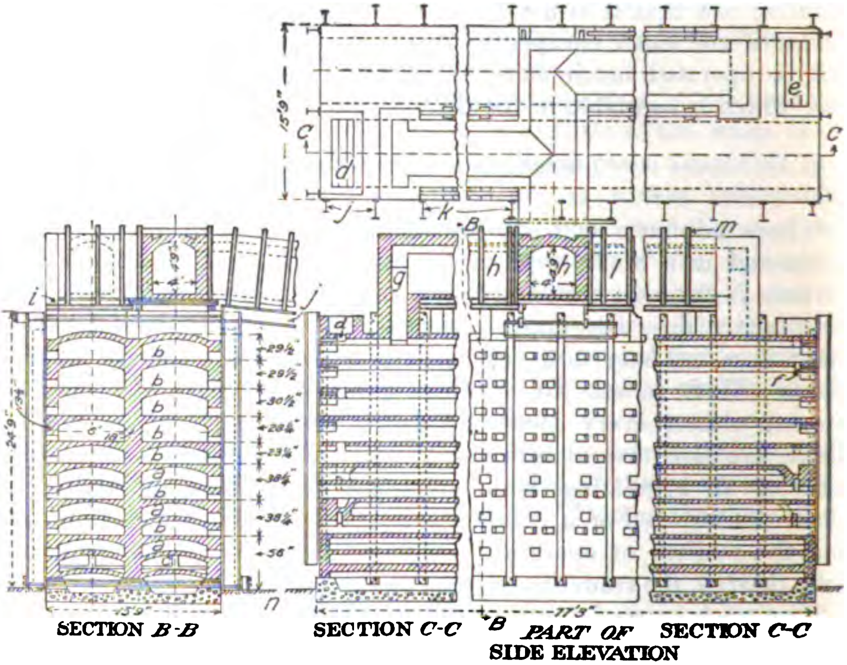

FIGURE 3.—Hegeler furnace for roasting zinc ores. *a*, Fire muffles; *b*, roasting muffles; *c*, muffles for preheating the air; *d*, *e*, feed hoppers; *f*, discharge into second muffles; *g*, flue for gases; *h*, flue to acid plant; *i*, 6-inch I-beam; *j*, 15-inch I-beam; *k*, 20-inch I-beam; *l*, flue; *m*, steel rails; *n*, kiln floor.

The hearths are closed at the ends by sheet-iron doors which are hinged at the top and are automatically opened and closed by the passage of the rabbles through the furnace.

When a Hegeler furnace is running on zinc blende alone, the gases from it seldom carry 5 per cent SO_2, the SO_2 content is more frequently nearer 4 per cent, and varies considerably.

The costs of roasting zinc blende in a Hegeler type of roaster at different plants and the roasting results obtained vary greatly, depending largely upon the skill of the operators. Prior to the war the working cost of a number of Hegeler furnaces was less than $2 per ton of ore treated, and averaged throughout the country about $2.50 per ton.

The first cost of a furnace with all the accessories, on a prewar basis of cost, was about $1,000 per ton daily capacity of blende roasted.

SPIRLET FURNACE.

Another type of blende roasting furnace used in connection with acid plants is the Spirlet. This type of furnace is used principally in Europe, but also is used in this country by the Grasselli Chemical Co., by the American Zinc, Lead & Smelting Co. at East St. Louis and Hillsboro, Ill., and by the National Zinc Co. at Argentine, Kans. At the latter plant a special construction has been developed for overcoming some of the mechanical troubles present in the operation of the original furnaces.

The Spirlet furnace has several rotating hearths, projections on the underside of one making the rabbles for the hearth beneath. These rabbles are made of special fireclay shapes, which can be removed only by closing down the furnaces and cooling them. The lowest hearth is muffled. The roasted ore is discharged from the periphery of the lowest hearth into a hopper where part of the heat is utilized to preheat the air, the remainder of the heat being supplied from a coal fire in a fire box.

According to Chase,[a] the Spirlet furnace requires about 10 per cent of coal as fuel, requires about 2 horsepower to operate a 5-ton furnace, and gives a gas high in SO_2 with a loss of 1 to 2 per cent zinc in the dust.

WEDGE (MUFFLE) FURNACE.

The combination muffle and reverberatory Wedge furnace has also been used for roasting zinc ore. In this type of roaster the heating over the upper hearths is by combustion of the ore. On the lower hearths the ore is heated by coal burned in an external fire box, the combustion gases coming in direct contact with the ore, but not mixing with the gases coming from the upper hearths.

DUST CHAMBERS AND FUME COLLECTORS.

In fines burners there is always considerable dusting of the very fine particles of ore, especially as the ore falls from floor to floor, and even when the burner is so designed as to permit the gases to rise at low velocities through the drop holes a certain amount of this very fine dust is carried out of the furnaces with the gases. There are also present volatilized metals or metallic compounds which are condensed as the gases are cooled, and as the particles of condensed fume are extremely fine, they are easily carried along by the gas streams.

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[a] Chase, M. F., Choice of a blende roasting furnace: Eng. and Min. Jour., vol. 104, Oct. 20, 1917, pp. 698–704.

The greater part of the mechanically carried dust must be removed from the gases before they go into the Glover towers of a chamber plant or to the scrubbing towers of a contact plant; otherwise the towers will soon be so filled by the dust that passage of the gases through them will be seriously impeded.

METHODS OF MECHANICAL PRECIPITATION.

The method most commonly employed for removing the mechanically carried dust is to pass the gases through a dust chamber or large flue where their velocity is greatly reduced and the dust settles out. Formerly it was believed that passing the gases through a long system of pipes or flues of such cross section that the velocity would not exceed 20 or 30 feet per second would permit settling of all the dust. Modern construction of dust flues or chambers permits reducing the velocity of the gases to not more than 5 feet per second and even less than 3 feet per second, the length of the flues being much less than formerly. A chamber 125 feet long will allow most of the pyrite dust to settle at a velocity of 3 feet per second.

At a chamber plant it is usually desirable to settle the dust with as little loss of temperature as possible, so that long flues are not satisfactory. Hence, various means have been tried for increasing the rate of settling within a comparatively short distance of travel and thus reduce the length of the flues. For example, some settling chambers are constructed with baffle walls or plates placed directly across the path of flow of the gases, with space at the top or bottom of the walls for the passage of the gases. The passing of the gases through these open spaces, however, sets up eddy currents which tend to keep the dust in circulation and thus neutralize to a large extent the effect of the baffles.

Hanging wires in the flues are effective in removing dust particles, and flues hung with wires will allow a satisfactory high dust recovery, even with a velocity of 6 to 8 feet per second. Usually the wires are hung 3 or 4 inches apart and the rows of wires are staggered so that there will be ample provision for the gases to impinge on the wire surfaces.

In the Gilchrist rod collector, constructed by the Chemical Construction Co., iron rods are used in place of wires. Arrangements are provided for vibrating the rods at definite intervals, which shakes the dust to the floor of the dust chamber.

The dust chambers or flues at modern chamber plants are now usually of brick, rectangular in cross section, with an arched roof. At contact plants or chamber plants where it is not so desirable to save all the heat possible they may be made of sheet iron. Frequently the flues are elevated, being supported by a steel structure, and the bottom is made up of a series of hoppers, whence the dust is discharged into cars run beneath.

Centrifugal force is applied in some plants to remove suspended particles from the gases. In the method generally used the gas is brought tangentially into a stationary container of circular horizontal cross section and withdrawn vertically upward through the axis of the container, as in the well-known type of cyclone dust catcher. The dust particles tend to be thrown out to the periphery and finally drop down into a receptacle provided for them beneath. This method is decidedly effective in removing fairly coarse dust, but its efficiency falls off very rapidly in dealing with smaller dust particles.

A dust collector was devised by Henry Howard (U. S. patents 970053 and 896111) having a series of horizontal parallel shelves spaced an inch or so apart, across which the gases pass in a slow stream from one chamber to another, the dust being deposited on the shelves. The dust is then removed by rabbles inserted through doors in the flue walls. With hot gases these shelves tend to warp, which makes cleaning difficult.

None of the above outlined methods for settling dust will remove metallic fumes. As previously stated, the fume particles are so extremely minute that they do not settle from the gas stream by gravity as do the flue-dust particles. Even though the gas stream is cooled so that complete condensation can take place and the velocity of the gases be reduced to a low rate, very little settling of fume occurs. Usually the fume consists of oxidized arsenic, zinc, or lead compounds. At only a few chamber plants, however, is the amount of this fume present in the gases so large that its presence is a serious factor. At contact plants special scrubbing and filtering devices are employed, as described in a subsequent connection, for completely removing these substances from the gases.

The method of removing dust and fume by filtration through cotton or woolen bags, as is employed at various metallurgical plants, has been suggested, but can not be utilized to remove dust from gases from pyrite burners because the sulphuric acid anhydride (SO_3) or sulphuric acid mist present would destroy the bags and because the temperatures are very much too high.

The use of fine wire screens and of asbestos in place of cotton or woolen fabrics has also been suggested and tried, but they have not proved serviceable, chiefly because of their high cost, clogging of the pores, rapid corrosion of the wires when fine enough to filter effectively, and the tendency of the asbestos to become brittle in highly acid atmospheres.

ELECTRICAL PRECIPITATION.

During the last few years several electrical precipitation units have been installed at acid plants for removing both the dust and the fume from the gases.

Plate V shows the interior of an electrical precipitation unit; Plate II, *C* (p. 61), shows an exterior view of a precipitator; and figure 4 shows the general arrangement of a precipitator installation.

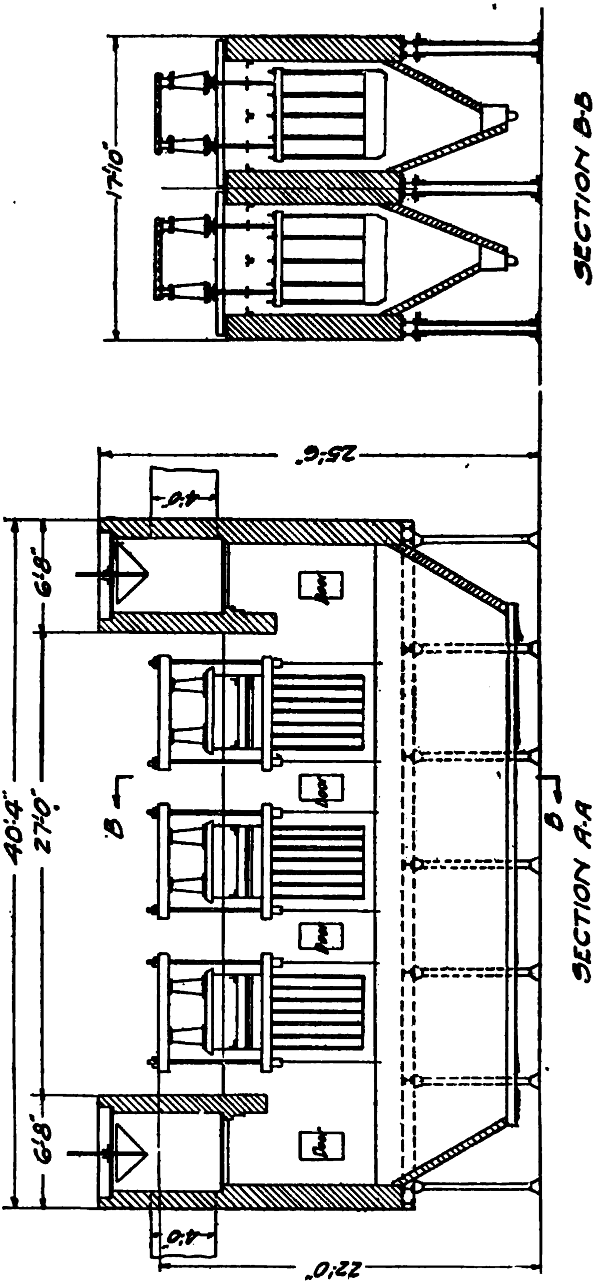
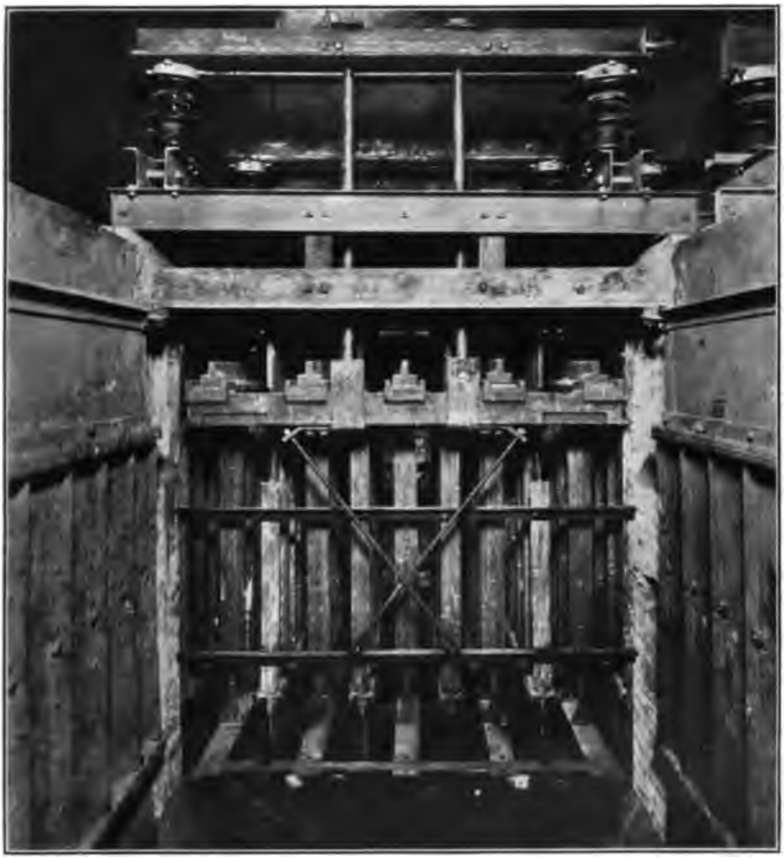


FIGURE 4.—General arrangement of electrical precipitation installation for cleaning gases from furnaces roasting pyrite fines. (By courtesy of the Research Corporation, New York.)

In the electrical precipitators the gases are caused to pass between two electrodes, one being grounded and the other under a high



INTERIOR OF ELECTRICAL PRECIPITATOR.

voltage, so that an electrical field of high intensity is maintained between them. In some plants the grounded electrodes are pipes through which the gases ascend or descend. In other installations the grounded electrodes are parallel plates of steel or sheet iron, the gases passing either horizontally or rising vertically between them. The charged electrodes are usually wires or chains or small rods. These electrodes are, of course, completely and carefully insulated. For charging this insulated electrode an intermittent direct current is used which is obtained by rectifying an alternating current of high potential. An alternating current from a power circuit is transformed to the desired high voltage, and the high-voltage current is then connnected to the treater through a special rotary contact rectifier driven by a synchronous motor. The voltage employed depends upon the spacing of the electrodes and somewhat upon the nature of the gases and dust being treated. With a spacing of 3 inches between the charged and the grounded electrodes the difference of potential maintained is about 28,000 to 30,000 volts. As the gases pass between the electrodes the particles of dust and fume are electrified and are precipitated, mostly on the plate or pipe electrode. Means are provided for tapping both the charged and the collecting or grounded electrode in order to remove the dust adhering to them. Hoppers are placed beneath the treaters so that the collected dust may be removed readily.

No attempt will be made in this bulletin to discuss the theories of electrical precipitation, or the general application of electrical precipitation to the problem of removing dust and fume from metallurgical smoke. These points are described in various papers, chief among them being an article by Cottrell[a] and one by Fulton.[b]

Precipitators are designed in units with an excess total capacity so that one or more units may be shut off by dampers for repairs or cleaning without raising the velocity too high in the other units.

The treaters have usually been designed to treat the gases at a velocity of less than 10 feet per second, usually around 5 feet per second. Thus, to treat the gases from a furnace roasting 45 tons of pyrite a day and producing gas with a sulphur dioxide concentration of 7½ per cent, or a total volume at 550° C. of about 13,000 cubic feet a minute, a treater having an effective area for passage of the gases of about 36 square feet would be necessary.

At the chamber acid plant of the Baugh Chemical Co., near Baltimore, Md., an electrical precipitator has been installed to treat the gases at a temperature of about 600° C., and occasionally, for short periods, as high as 750° C. At these high temperatures, certain metallic fumes, such as arsenic compounds, would not be removed, but all dust and fume constituents possessing high volatilization points are effectively recovered.

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[a] Cottrell, F. G., Problems in smoke, fume, and dust abatement: Annual report for 1913, Smithsonian Inst., pp. 653–685.

[b] Fulton, C. H., Metallurgical smoke, Bull. 84, Bureau of Mines, 1915, pp. 59–65.

At practically all acid plants where installed, the electrical precipitators have been satisfactory as dust collectors, and where the temperatures have been reduced to the necessary points, metallic fumes have also been recovered.

The Research Corporation owns and controls the right to the electrical precipitation process, as applied to cleaning gases from pyrite burners, throughout the United States, except in Washington, California, Idaho, Nevada, and Arizona. Either a royalty or a license fee is charged for the use of the process.

Some data relative to the electrical installations for cleaning furnace gases at acid plants in this country are given in the following table:

Data on electrical precipitator installations for cleaning roaster gases in the manufacture of sulphuric acid.

Installation.	Volume of gas, cubic feet per minute.	Temperature of gases, °F.	Type.	Source of gas.	Cost of installation.
A	15,000	1,200	Plate and strip, two sections	Pyrite—Herreshof burners	$18,000
B	8,650	1,000	Plate and strip, three sections	Zinc ores—Matthiesson and Hegeler kilns	20,000
C	12,000	600	Square pipe, 2 units of 20 pipes each	Zinc ores—Skinner kilns	7,900
D	17,000	360	Pipe, 2 units of 36 pipes each	Zinc ores—Mathey kiln	30,000
E	8,000	1,300	Plate and strip, one section	Zinc ores—Matthiesson and Hegeler kilns	12,500
F	18,000	800	Plate and strip, two sections	Pyrite—Herreshof burners	24,000

From dust chambers or flues, or centrifugal separators, or electrical precipitators, the gases at a chamber plant are conducted directly to the Glover towers. At a contact plant the gases are conducted to scrubbing and cooling towers and through filters to remove the last traces of fume. These special fume removers are discussed later under the description of the contact process.

CHAMBER PROCESS FOR MANUFACTURE OF SULPHURIC ACID.

GENERAL PRINCIPLES.

The chamber process consists essentially in bringing together under suitable conditions sulphur dioxide, oxygen, and water, in the presence of the oxides of nitrogen, with the resultant formation of sulphuric acid. The reactions that actually take place between these substances in the chamber are rather obscure, although the end result is as though the reaction was $SO_2+O+H_2O=H_2SO_4$—that is, as though the oxides of nitrogen did not react. However, it is known that this reaction will not take place in the chamber without the presence of the nitrogen oxides. In practice much more water is needed to bring about the reaction than is theoretically required for the production of H_2SO_4. The sulphuric acid formed in chambers is therefore always dilute. The theory as to the chemistry of the reactions is discussed briefly below.

For the manufacture of sulphuric acid by the chamber process, besides the burners, flues, dust chambers, etc., there are three principal elements—(1) the Glover towers, (2) the acid chambers, and (3) the Gay-Lussac towers. In most plants the "niter pots" or retorts may also be considered one of the principal elements. In addition there must be the necessary fans, pumps, pipe lines, storage tanks, and other accessories. The general flow of gases and reacting material through these elements is as follows:

The gases coming from the pyrite or sulphur burners usually contain 5 to 8 per cent sulphur dioxide, a small proportion, usually less than 0.5 per cent, of sulphur trioxide, 10 to 14 per cent oxygen, about 80 per cent nitrogen, and some water vapor. The ratio of oxygen to sulphur dioxide depends on whether the material being burned is sulphur or pyrite. The dust is largely removed by the dust-collecting devices previously described; the hot gases then go to a Glover tower, passing upward through the packing or filling of the tower, where they come in contact with a down-flowing stream of weak sulphuric acid, and also the "nitrous vitriol" or the cold acid that has been used in the Gay-Lussac tower for recovery of the nitrogen oxides. Between the dust chamber and the Glover tower are usually placed the "niter pots," in which the necessary quantities of oxides of nitrogen are generated and added to the gases going to the Glover tower to maintain the proper amount of those oxides in the system. Other methods of adding the fresh supply of nitric acid to the system will be described later.

The hot ascending gases evaporate a considerable portion of the water from the weak acid, thereby concentrating the sulphuric acid and at the same time releasing the nitrous acid from the "nitrous vitriol." The released oxide of nitrogen, the sulphur dioxide gas, and the water vapor pass over into the lead chambers, where the reactions take place for the production of sulphuric acid. After leaving the chambers, the gases—consisting essentially of nitrogen, the excess oxygen, the oxides of nitrogen, and acid mist or water mist—are led through the Gay-Lussac towers, where the nitrous acid gas is absorbed and recovered from the waste gases by strong sulphuric acid, forming "nitrous vitriol." The waste gases are discharged from the top of the Gay-Lussac tower either directly into the air or into a flue leading to a stack. As already indicated, the nitrous vitriol thus obtained is conducted to the Glover towers diluted with chamber acid, and the nitrous acid gas is again liberated by heat and passed into the chamber system.

The acid produced in the chambers is dilute, containing only about 60 to 65 per cent H_2SO_4, and at many plants a large part or all of this chamber acid is passed through the Glover tower and concentrated to about 75 or 80 per cent H_2SO_4.

Although there are various types of chambers and intermediate towers and apparatus between chambers to increase the speed of the chemical reactions, the Glover towers and the Gay-Lussac towers are generally built on approximately the same lines and their operations are very similar at most plants.

Several theories have been advanced to explain the reactions occurring in the Glover towers and the lead chambers, and the part taken in these reactions by the nitrogen oxides. The most generally accepted theory is that of Lunge,[a] which is a result of his elaborate investigations made in 1884. Under this theory, sulphur dioxide (SO_2), nitrous acid anhydride (N_2O_3), oxygen, and water vapor unite directly to form "nitrososulphuric acid," the reaction being as follows: $2SO_2+N_2O_3+O_2+H_2O=2SO_2(OH)(ONO)$. This complex compound floats around in the chamber as a mist until meeting water mist particles, either as water or in the form of very dilute sulphuric acid; the nitrososulphuric acid is broken up into sulphuric acid and nitrous acid, as follows: $2SO_2(OH)(ONO)+H_2O=H_2SO_4+N_2O_3$.

Various secondary reactions have been suggested. In the first lead chamber in the Glover tower where the temperatures are relatively high and there is an excess of water vapor, the following reaction is supposed to occur: $2SO_2(OH)(ONO)+SO_2+2H_2O=3H_2SO_4+2NO$. As there is usually an excess of oxygen also present the nitric oxide (NO) thus formed is at once brought into reaction again, as follows: $2SO_2+2NO+3O+H_2O=2SO_2(OH)(ONO)$.

If there is a deficiency of oxygen, the nitric oxide is not completely reoxidized to nitrous acid (N_2O_3) and returned to the process, but passes through the several chambers, and as the nitric oxide is not readily absorbed by the acid in the Gay-Lussac towers, it escapes into the atmosphere. A portion of the nitric oxide (NO) reacts with the sulphuric acid and oxygen or with sulphur dioxide, water vapor, and oxygen to form nitrososulphuric acid again; in other words, these reactions are reversible, and all of them may be taking place at the same time in the first chamber or in the Glover tower. Various other secondary reactions have been determined or their existence has been indicated, all of which are discussed in great detail in Lunge's book. It is to be noted that whatever may be the real sequence or types of reactions, in all instances the nitric acid and the oxides of nitrogen do not act as true catalyzers, inasmuch as these compounds themselves enter into the reactions.

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[a] Lunge, George, Sulphuric acid and alkali, pt. 2, 1913, pp. 987–1038.

The main reacting nitrogen compound or oxygen carrier is nitrogen trioxide, or nitrous acid anhydride, and the efforts discussed later to increase the efficiency of the chamber process have been largely aimed at increasing the activity of the nitrous acid.

THE GLOVER TOWER.

The chief functions of the Glover tower are: (1) The denitration of the nitrous vitriol, (2) the conversion into nitrous acid of the nitric acid which is added to make up for the nitrous acid lost in the process, (3) the concentration of weak chamber acid, (4) the cooling of the furnace gases, (5) production of acid in the upper part of the tower, (6) the cleaning of the furnace gases from impurities.

DENITRATION OF THE NITROUS VITRIOL.

The denitration of the nitrous vitriol is the most important and characteristic function of the Glover tower. The nitrous acid gas from the chambers is absorbed at the Gay-Lussac towers in cold sulphuric acid of about 78 per cent H_2SO_4 strength. The nitrous vitriol so obtained contains N_2O_3 in amounts equivalent to 2 to 4 per cent of $NaNO_3$, or 30 to 60 ounces $NaNO_3$ per cubic foot of acid. This is diluted with weak chamber acid and is sprayed down over the packing of the Glover tower, where it is exposed to the ascending hot furnace gases. By the dilution and heat, together with the reaction with sulphur dioxide and water, the nitrous acid is released. To be properly denitrated, the strength of the acid entering the top of the tower should not be over 57° B. (72 per cent H_2SO_4).

The Glover tower top is designed to give a uniform distribution of the acid and to expose it in as fine a state as possible to the ascending gases. The acid feed to the tower should be carefully regulated, for not only is the chief quantity of niter supplied there, but also, by the concentration of the chamber acid, a large quantity of steam is generated for the chambers. In fact, the whole of the chamber reactions depend almost entirely upon the successful working of the Glover tower.

The denitration takes place in the upper part of the tower. The amount of sulphuric acid circulated through the Gay-Lussac and the Glover towers varies greatly at different plants, from a ratio of 1 ton of circulating acid to 1 ton of acid produced, to a ratio of 3 tons of circulating acid to 1 ton of acid produced. In common practice where brimstone is used, and the plant is not being forced to work with low chamber space, the acid circulating is about 1.5 times the acid produced. With an average N_2O_3 content of the nitrososulphuric acid equivalent to about 2.5 per cent $NaNO_3$, or 40 ounces $NaNO_3$ per cubic foot of acid, the $NaNO_3$ content of the nitrous vitriol is equivalent by weight to 13.8 per cent of the sulphur burned. In addition, approximately 3.5 per cent of nitrate of soda is added to the circulating acid, making the total proportion of $NaNO_3$ in circulation equivalent to 17.3 per cent by weight of the sulphur burned. When the chamber plants are being forced, that is, run at 11 cubic feet or less of chamber space per pound of sulphur, the amount of niter in circulation is usually nearly 30 per cent of the weight of the sulphur. No two acid plants shows uniform results as regards the content of oxides of nitrogen in the nitrous vitriol, or the volume of such acid being circulated per unit quantity of sulphur burned. A maximum figure for niter circulation should be decided upon for each set, as too much niter circulating has a detrimental effect upon the chamber leadwork. When pushing the chambers, and using a greatly reduced space per unit of sulphur burned, the niter circulation is necessarily raised and, as is shown in a subsequent connection, this undoubtedly contributes largely to the increased wear and tear found under these conditions.

The nitrous vitriol from the Gay-Lussac towers is usually diluted with weak chamber acid rather than water. The mixing is often done outside the tower, or the strong nitrous vitriol and the weak acid are fed separately into the top of the Glover tower through properly trapped holes and are then mixed in the top part of the Glover tower with, also, any nitric acid which may have been added to maintain the niter content. The dissolved nitrogen oxides are removed rapidly in the higher parts of the tower by dilution and heat and the presence of sulphur dioxide. The nitrososulphuric acid resists separation from the sulphuric acid, and the last traces of it are removed probably only by the following reaction: $2SO_2(OH)(ONO)+SO_2+2H_2O=3H_2SO_4+2NO$. The NO passing up the tower along with the oxygen is converted into N_2O_3. Up to a strength of about 58° B., sulphuric acid can be denitrated by hot sulphur dioxide gas, but it is not desirable to have the acid reach the zone of final denitration at a stronger strength than 58° B., even though excess sulphur dioxide and water vapor may be present in that zone.

CONVERSION INTO NITROUS ACID OF THE NITRIC ACID ADDED.

For reasons that are discussed in a subsequent chapter (p. 118), there is always some loss of nitrous acid in the process, and this loss is usually made up by adding nitric acid.

Where the necessary nitric acid is added to the gases by "potting" the nitrate of soda prior to the entrance of the gases into the Glover tower, the Glover tower performs the function of converting the nitric acid gas into nitrous acid gas, through reactions with the nitrososulphuric acid, sulphuric acid, sulphur dioxide and the other oxides of nitrogen that are probably present, at least momentarily.

The most efficient, direct, and most easily controlled method of supplying the chamber process with the nitrogen oxides is to prepare outside the tower a mixture of nitric acid and sulphuric acid, and to add this nitric-sulphuric acid mixture with the nitrous vitriol from the Gay-Lussac tower. The nitric and sulphuric acid mixture is prepared by "potting" the nitrate and passing the nitric acid gases into sulphuric acid in a lead tank which is provided with cooling coils to keep the acid mixture cool and prevent loss of nitrogen oxides.

At some plants the bags in which the nitrate of soda is received are leached with water and the water solution of sodium nitrate is put directly into the Glover tower. Spent acids from explosives manufacturers, containing 10 to 15 per cent nitric acid and 70 to 80 per cent sulphuric acid, are occasionally introduced directly to the Glover tower, and the nitric acid is decomposed to nitrous acid and is taken into the system.

CONCENTRATION OF WEAK CHAMBER ACID.

As previously stated, in order to denitrate the nitrous vitriol it is necessary to dilute the vitriol, and this is usually done with chamber acid. The denitration takes place in the upper part of the Glover tower; the weak denitrated acid then descending through the tower is concentrated by the hot ascending gases, the resulting steam passing into the chambers to supply a part of the steam necessary for the process.

For towers of ordinary construction and in the customary practice, the Glover tower will readily concentrate to about 60° B. strength more acid than is required for the Gay-Lussac towers. In a well-designed tower and with hot furnace gases—that is, gases entering the tower at 350° C. or more—it is possible to concentrate all the chamber acid produced to 60°.B., or even higher. The acid from the Glover tower issues hot, about 130° C., and usually contains a little sulphur dioxide, but is comparatively free from the oxides of nitrogen. This acid also contains arsenic and selenium if these metals were present in the ore, and dust or fumes either in solution or suspension if removal has not been effected in the dust and fume collectors.

COOLING THE FURNACE GASES.

If the hot furnace gases were permitted to enter the chambers without being properly cooled, the heat of the gases, when added to the heat of oxidation of the SO_2 to SO_3, would be detrimental to the lead chambers and also to the process. Thus, just as it is usually important to conserve the heat in the gases going to the Glover tower in order to get the maximum evaporation possible, it is also desirable to reduce to a safe point the temperature of the gases as they issue from the Glover tower.

The temperature of the gases issuing from lump and fines burners will run between 450° and 600° C., and, as a satisfactory dust recovery can usually be obtained at less than 500° C., delivery of the gases to the bottom of the Glover tower at about 350° to 450° C. is possible. Gases from a brimstone burner can usually be delivered almost directly from the burner to the tower at a temperature around 450° C. The gases should issue from the top of the Glover tower at a temperature not higher than 90° C., otherwise cooling towers are necessary between the towers and the chambers. The usual temperature of the gases at the top is about 75° to 80° C.

PRODUCTION OF SULPHURIC ACID IN UPPER PART OF THE GLOVER TOWERS.

The liberation of the oxides of nitrogen in the Glover tower, in the presence of moisture and sulphur dioxide, together with the cooler temperatures at the top of the tower, gives the conditions requisite for the formation of sulphuric acid. In well-operated and well-designed towers as much as 20 per cent of the total production of acid from the plant may be formed in the tower. Usually the production in the Glover tower is only about 12 to 15 per cent of the total.

CLEANING THE FURNACE GASES.

As a rule, nearly all the very fine dust—oxide of iron, or unburned pyrite—that is mechanically carried through the flues and settling chambers by the gases is caught in the Glover tower, and is washed out of the tower by the acid either in suspension or as sulphate solution. With efficient dust collectors between the furnaces and the Glover tower, the quantity of this material collected in the tower should be relatively small. However, unless the gases are cooled and special devices are installed to collect the arsenic and selenium, the latter collect largely in the tower and are also washed out by the tower acid. Arsenic dissolves as arsenious oxide, and when present in large quantities sometimes separates again as fine crystals when the Glover-tower acid is cooled. When much arsenic is present, all of it is not caught in the Glover tower, a large portion being carried on into the chambers, where it has a deleterious effect upon the lead. Selenium, when present, colors the acid red.

Zinc and lead fumes also are partly collected at the Glover tower when the ores being burned contain those metals.

CONSTRUCTION OF GLOVER TOWERS.

Nearly all Glover towers have an outer shell of lead, provided with an acid-proof stone, "volvic lava," or brick lining, and packed with pure massive quartz or acid-proof brick or tile. In plants recently constructed by the Chemical Construction Co. or the Process Construction Co. the lead shell has been eliminated and the towers are built entirely of chemical brick laid in an acid-proof cement.

The size and shape of Glover towers vary greatly. There are circular, square, rectangular, and octagonal shaped towers, varying in height from 15 to 60 feet and in area of external cross section from 25 to 700 square feet. It is claimed by many acid men that at an average plant the height of the tower should not exceed 25 feet, of which not more than 18 feet is filled with packing, and that the size should be a matter of variation in cross section rather than in height. The tower is designed to meet the demands made upon it, in any event being so proportioned as to absorb in concentration nearly all or all of the heat in the gases. Thus, the height and area should be determined largely by the nature of the raw materials to be burned, the possible heat loss between burner and tower, and the effective scrubbing surface afforded by the packing medium. While there is a tendency to build higher towers in order to utilize as far as possible the heat of the gases, and thus get good denitration and efficient concentration, yet unduly high towers tend to increase condensation in the upper part, and thus the net result is to reduce the effectiveness of the tower as a concentrator.

As to the shape of the tower, some constructors prefer one form, some another. For a unit weight of lead, acid-proof brick wall, and tower lining the circular tower has a greater surface area for scrubbing or absorption than the square or rectangular tower, and there are no dead corners, etc. With proper gas and acid distribution, the efficiency of the towers of different shapes per unit of packed volume does not vary greatly. For lining round towers special radial brick are required, and these are more expensive to make and to lay than the square brick. A tower of square, rectangular, or even octagonal section is much easier to construct than a round tower, especially if the tower is to be built of acid-proof brick.

In designing a Glover tower it is necessary to provide for the severe duty the tower is called upon to perform. Part of the tower is in contact both with gases having a temperature ranging up to possibly 500° C. and with sulphuric acid having a strength ranging up to 60° B. or even 66° B. In other parts of the tower are present nitrogen oxides, sulphur dioxide, sulphuric acid, and steam. Thus, if chemical brick or tile are used for lining or for packing, they must be of the best selected quality.

When lead is used for the tower outer walls, as has been the usual construction, it is customary to make the top and sides of 16-pound lead and the bottom of even heavier lead. The tower should be built on a firm masonry foundation which is covered with a thin layer of pitch and sulphur melted together and further protected by the acid pan of lead. Some designers attempt to cool the underside of the tower bottom by introducing air channels or by having water circulate around the pan.

The framework for the towers may be of wood or steel. Wooden frames are still common, though steel is usually preferred, especially when the towers are built of acid-proof brick.

It is customary to provide a fairly thick lining to conserve the heat. In the lead towers the usual method is to make the lining at the bottom 18 inches to 24 inches thick up to a point above the top of the gas inlet. Above this point the thickness is then reduced, leaving a shelf 6 inches to 9 inches wide, which extends around the tower. Resting partly upon this shelf and partly upon several piers or arched walls, which are carried up to the same height, is the grid that supports the tower packing. Below this "grid" or "grill" is a chamber of considerable size, the walls or piers supporting the grid being so arranged that their presence does not obstruct the passage of the gases but tend to distribute the gases evenly over the entire bottom of the tower.

The grid may be of deep, narrow beams of "volvic lava" or of acid-proof stoneware. The spaces between the ends of the grid beams should then be filled with lining brick to prevent the beams from falling over sidewise.

The repacking of a Glover tower is an expensive operation and great care should be exercised in the selection of the material going into the tower and also in the manner of placing the grid and the tower packing.

Various methods have been employed for packing towers, and it is not thought desirable in this paper to discuss the methods in any detail. Unless the design and construction of a tower can be based upon satisfactory actual experience, it is best to employ an expert to lay out the tower. This remark, of course, also applies to the design and construction of the whole acid plant. A tower too tightly packed offers too great a resistance to the passage of the gases, which causes the gases to travel through the spaces at too high a velocity and also results in an unduly high cost of power for pulling or driving the gases through it. A tower too loosely packed is as objectionable as one too tightly packed, for although the velocity of the gases is reduced, the descent of the acid is accelerated and the necessary length of time for the reactions, etc., is not given.

For the packing material, flint or massive quartz formerly were used exclusively. The quartz to be entirely satisfactory must be free from cleavage lines and contain no admixture of schists or foreign matter. Acid-proof brick is now being made which lasts almost indefinitely, except where the ore, which is burned to produce the acid, contains fluorite. The hydrofluoric acid or fluorine produced decomposes the brick. One instance is recorded where the Glover tower packing was rendered valueless within two years by the presence of fluorite in the ore used. Frequently the towers are packed partly with chemical brick and partly with quartz—say the lower three-fourths of brick and the upper one-fourth of quartz.

A typical modern Glover tower is that designed by the Process Engineering Co. and built by the Calumet & Arizona Mining Co., at Douglas, Ariz. The chamber plant has a capacity of 210 tons of 60° B. acid per day. The Glover tower (fig. 4) is octagonal, 22 feet 2 inches in diameter by 56 feet high. It has a steel frame holding the walls, which are built of duro brick laid in "duro" cement, containing about 96 per cent silica mixed with sodium silicate as a binder. The tower is packed with duro tile, 1½ by 6 by 12 inches, laid in checker formation. The tiles are so laid as to be self-supporting and thus exert no thrust upon the walls, as when quartz packing is employed. This acid resistant "duro tile" is made by the Harbison Walker Refractories Co.

Another modern form of Glover tower packing is the "chemico" ring, made by the B. Mifflin Hood Brick Co., of Atlanta, Ga., under a license by the Chemical Construction Co. These rings are made in 3-inch and 6-inch sizes. The ring (see Pl. II, *B*, p. 61) contains in the interior a ribbon-like spiral winding from top to bottom, all made in one piece of chemical stoneware.

With a tower 25 feet high the actual packing will not exceed 16 feet in height—12 feet of checkered brickwork and 4 feet of quartz. If brick is used, the brick should be placed on edge, forming spaces say 4 by 4 inches. The actual packing space usually allowed per ton of sulphur burned daily is 200 to 300 cubic feet.

The top of the tower is of lead, or in the towers constructed of acid-proof brick the tops also are of brick. The top plate is not so subject to heavy wear and tear because it is largely cooled by the incoming acids, and, being somewhat above the outlet from the tower, is at the top of a dead space.

Various schemes are in use for distributing the nitrous vitrol or weak chamber acid through the top of the Glover tower onto the packing. The most common is to provide small depressions or cups all over the top, each cup being oval and divided by a partition into two equal acid-receiving cups. At the bottom of each of these half cups a small pipe extends down into the tower a few inches, and up into the half cup 2 to 5 inches. Lead thimbles inverted over the

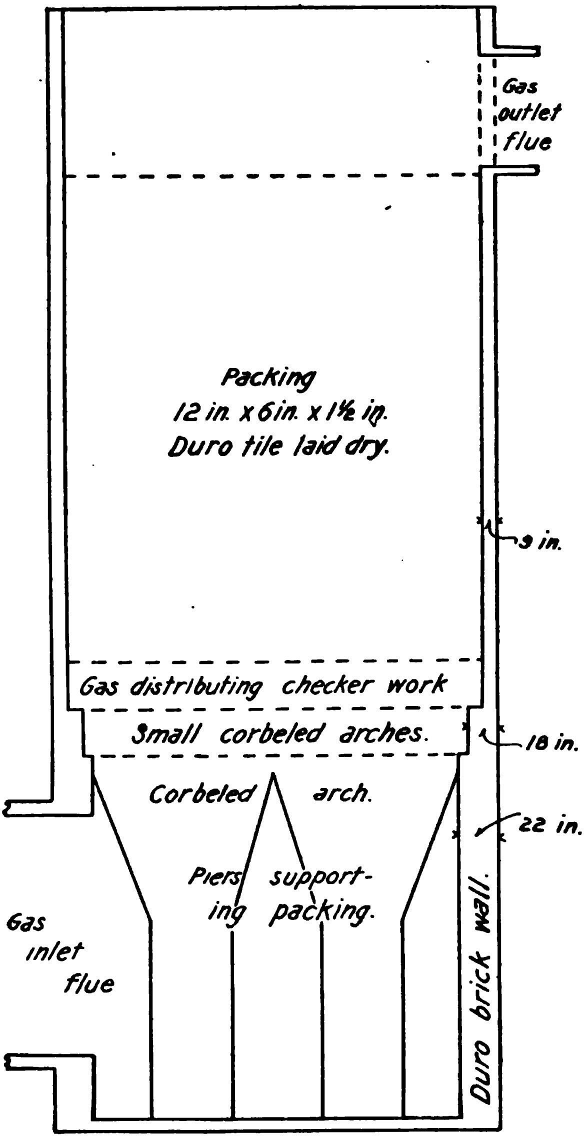


FIGURE 5.—Outline sketch of Glover tower. (By courtesy of Mining and Scientific Press.)

COOLING TOWERS AT PLANT OF CALUMET & ARIZONA MINING CO.

(By courtesy of the Mining and Scientific Press.)

upstanding pipes complete the liquid lutes. As the acid runs from distributing pipes into the depression it fills the depression until it overflows down the upstanding pipe into the tower.

In many plants lead pipes emanate from a trough or series of troughs placed on top of the tower, and the acid is carried directly by these pipes through the top and falls on the tower packing.

COOLING TOWERS BETWEEN GLOVER TOWERS AND CHAMBERS.

At plants equipped with low Glover towers, or where the temperature of the gases going to the tower is so high that the gases issue hot from the top of the tower, it is necessary to cool the gases before they are admitted to the chambers. Cooling towers vary widely in size and shape, material used, and other features. The cooling towers (Pl. VI) designed and constructed by the Process Engineering Co. at the plant of the Calumet & Arizona Mining Co., may be mentioned as satisfactory modern coolers. The towers are 41 feet high and 17½ feet in diameter and are built of lead sustained by a steel frame. The gas enters at the bottom and leaves at the top, both inflow and outflow pipes being connected tangentically so as to induce a spiral motion to the gases. It is claimed that this motion drives the gases toward the periphery, and facilitates radiation of heat through the lead walls.

CHAMBERS.

The gases leaving the Glover towers or cooling towers consists principally of sulphur dioxide, with a large percentage of sulphur trioxide, nitrous oxide, oxygen, nitrogen, and water vapor. Usually, if the Glover tower has been functioning properly, the gas contains sufficient water vapor to carry on the process for a considerable distance in the chambers. The functions of the chambers are:

(1) To afford space in which the gases may mix and the various chemical reactions take place by which sulphur dioxide is converted into dilute sulphuric acid. These reactions have been discussed in a preceding paragraph.

(2) To radiate the heat produced by the chemical reactions.

(3) To afford surfaces to facilitate condensation of the sulphuric acid as it is formed.

In carrying out these functions of the chamber, it is necessary to add water vapor in addition to that present in the gases coming from the Glover tower.

The efficiency of a lead chamber plant is measured by (1) the amount of chamber space required for each unit of sulphur burned per unit of time, usually expressed as cubic feet of space per pound of sulphur per 24 hours, (2) the amount of acid made per unit of sulphur burned, and (3) the consumption of nitrate of soda.

It is generally agreed that, provided the gases are present in the proper proportions, the two most important conditions necessary for efficient production are (1) thorough mixing of the gases and (2) perfect control of temperature.

The necessity of thorough mixing of the gases is evident, as intimate contact of the reacting substances with each other is essential for complete reactions. In making acid too low a temperature lessens the activity of the gases, whereas a temperature above 100° C. prevents the condensation of water necessary for the completion of the reactions.

In earlier days the chamber space consisted of a single long horizontal chamber, and the reactions were all completed in this chamber. The space required for the completion of the reactions in the single-chamber system, however, was excessive, and gradually series of smaller chambers were substituted.

As the sizes of the plants were gradually increased and the number of chambers at a plant was increased considerable attention was given to the subdivision of the total chamber space in such a way as to increase its efficiency. F. J. Falding, one of the leading experts in acid manufacture during the period of rapid growth of the industry in the South, advocates that if the cubic capacity of the plant is large, the proper method of design was to proportion that space between, say, three or more chambers, having the proportion between chambers 1, 2, and 3 as 4:2:1. Falding also advocated chambers of exceptional height, which type of chambers will be discussed later.

In modern construction of the ordinary horizontal type of chamber plant it is customary to build the chambers of a plant with approximately equal capacity, even when the plant is very large. The height is rarely more than 40 feet or the width more than 60 feet, but the length may vary from 50 to 236 feet. The latest chambers of the Tennessee Copper Co. are 236 feet long. In any given set of ordinary horizontal chambers it is rarely advisable to vary the sectional area, and this seldom can be done with saving of ground space, labor, or building economy. The sectional area employed is usually determined by the structural and economic conditions at the plants. In general, the cheapest sectional area, other factors being the same, is that which will give the least area of lead surface with the greatest cubic capacity. However, as the smaller lead surface area reduces the radiating capacity of the chambers, the saving in chamber construction may be offset by the necessity of providing extra cooling towers between chambers. Recent data collected from a number of plants having the ordinary horizontal rectangular chambers in different sizes, from 15 to 45 feet in height, from 20 to 60 feet in width, and from 50 to 230 feet long, showed a variation from 8.5 to 20 cubic feet in the chamber space required per pound of sulphur burned per day. Most plants that were seemingly operated with fair efficiency, and were burning high-sulphur pyrite or brimstone, were using 11 to 13 cubic feet of chamber space. A few plants were using less than 10 cubic feet, and several especially well operated plants using brimstone were using less than 9 cubic feet of chamber space. Many plants treating waste gases at zinc or copper plants were so handicapped by the fluctuations in gas concentration and by the average low concentrations that a much greater chamber space was required. At zinc plants during the war much higher chamber efficiencies were obtained by burning brimstone in conjunction with the zinc ore, so that the gas concentrations were higher and the percentage fluctuations much less.

With the ordinary type of plant, the yield of sulphuric acid is usually about 4.65 tons of 50° B. acid per ton of sulphur burned, as against a theoretical yield of 4.92 tons per ton of sulphur burned. Thus, the ordinary type of chamber plant has an average efficiency of about 94.6 per cent. Some of the ordinary plants, however, have made for long periods as much as 4.8 tons 52° B. acid per ton of sulphur burned or 97.6 per cent of the production theoretically possible.

Practically all the active work of an ordinary horizontal chamber is performed within the first 30 per cent of its chamber space. The remainder of the chamber is relatively much less efficient unless special means are employed to mix the gases vigorously and permit condensation of the vapors or mist.

There have been many modifications of the ordinary type of chamber plant, involving changes in the design of the chambers and also changes outside the chambers in the form of cooling towers, "converters," intensifiers, and other apparatus, all designed to provide more efficient cooling and mixing of the gases. Before passing to a description of these, however, it will be well to discuss a few of the more important features involved in the operation of the ordinary chambers, as many of these considerations are applicable to all types of chamber plants.

IMPORTANT FEATURES OF OPERATION.

ADDITION OF WATER.

The water vapor coming over with the gases to the chambers from the Glover tower is usually sufficient to carry on the process in the first part of the chamber. From then on, more water vapor must be added to maintain the process. Formerly, the supply of water vapor to the chambers was almost universally in the form of steam at low pressure, the steam being admitted through the roof of the chambers. In some more recent installations, the water is added to the front chambers as spray and to the rear chambers as steam. Some plants use only water. In a plant of recent construction, where there are six chambers, each 143 feet long, 59 feet wide, and 41 feet high, with cooling towers between the chambers, the total capacity of the chambers and intermediate cooling towers being about 2,155,000 cubic feet, the water is added through Schutte & Koerting platinum-tipped sprays as a very fine mist. The first chamber of this installation is provided with 12 jets, each spraying 2½ gallons per hour; the second chamber has 24, the third has 28, and the fourth has 24 jets, each of these spraying 5 gallons per hour; the fifth has 20, and the sixth has 12 jets, each delivering 2½ gallons per hour. The intermediate cooling towers also have one jet each, spraying 2½ gallons per hour.

At the large chamber plant of the Tennessee Copper Co., where an enormous number of low-capacity sprayers would have been required to supply the quantity of water needed for the large-scale operations, a special atomizer has been developed which is capable of atomizing as much as 50 gallons of water per hour. By the use of this atomizer, water spray has been substituted for steam in most of the chambers. A new spray (U. S. patent No. 1099028), manufactured by the Monarch Manufacturing Works, Philadelphia, Pa., is now on the market.

The advantage of water sprays over steam lies principally in a saving of coal and lower temperatures in the chambers, which results in a considerable saving in chamber space.

The water used in the sprays must be well filtered in a general filter, and in addition a small lead strainer provided with the finest mesh wire gauze should be inserted in the water-supply line next to the spray nozzle.

For a given charge of sulphur producing a constant supply of gas of uniform sulphur dioxide content, with a Glover tower supplied with a steady stream of nitrous vitriol and nitric acid, a constant supply of water vapor to the chambers will be required. Therefore, after the steam or water supply is once regulated and means are taken to insure its admission at a uniform rate, no change should be required until something goes wrong, when the cause for the change must be determined and rectified.

STRENGTH OF ACID DRIPS.'

The addition of water vapor is generally governed by the strength of the acid in the "drip cup" (fig. 6). Usually the drip cup is a small trough or saucer, *a*, burnt on the inner surface of the lead curtain or side wall of the chamber, and communicating with the outside by a pipe, *b*, bent to make a seal. This trough collects the acid as it drips down on the surface of the lead above the cup; the acid thus collected drains through the seal into a small jar, *c*, provided with a hydrometer. Table drips are also occasionally used, consisting of lead pans set well within the chamber and away from the side and connected by means of a lead pipe with the exterior of the chamber, similarly to curtain drips.

The acid collected by the curtain drips is usually 3° or 5° B. weaker than that collected in the table drips. The lead walls, owing to the radiation of heat from them, are cooler than the interior of the chamber, and therefore more water condenses there than in the interior, thus making the acid at the walls weaker than in the interior.

The strength of the acid in the drips varies considerably at different plants, and the relation of the strength in the drips to the strength of the acid actually falling over the chamber bottom should be known at each plant and at each chamber. It is evident that the absolute strength of the drip is not so important as is the variation of strength from day to day and from the first chamber to the last. A curtain-drip strength of, say, 50° B. means nothing unless from experience and frequent tests it is known that this reading at this special drip or set of drips shows that the acid formed in the chamber in question has a certain relative strength. Furthermore, as will be shown later, drip strengths are of little value as an indicator of operations unless taken in conjunction with chamber-temperature readings.

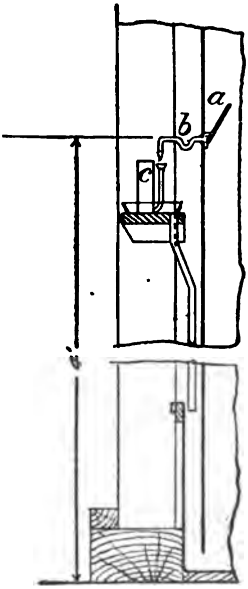


FIGURE 6.—Chamber drip. *a*, saucer; *b*, connecting pipe; *c*, receiver.

Within certain limits the strength of the drips may vary without any serious consequences. In the first chamber, or rather in the front part of the first chamber, where the water content of the mixture is dependent largely upon the steam generated in the Glover towers, the acid strength can not be controlled closely, but the strength seldom falls below 52° B. If there is a deficiency of water in the chambers, and the strength of the sulphuric acid being formed gets much above 52° B., the sulphuric acid begins to absorb nitrous acid in considerable quantities. The conditions for the formation of sulphuric acid in the reactions between nitrososulphuric acid and water are deteriorated; thus with deficient moisture, and especially if the temperature falls too low, the nitrososulphuric acid may separate as crystals, which deposit at various points on the walls as "chamber crystal." When steam or water comes in contact with the crystallized nitrososulphuric acid it decomposes into sulphuric acid, nitric oxide, and nitrogen peroxide (N_2O_4) according to the equation $4SO_2(O\ H)(O\ NO)+2H_2O=4H_2SO_4+N_2O_4+2NO$. The N_2O_4 unites with H_2O to form nitrous acid (HNO_2) and nitric acid (HNO_3) directly on the walls, corroding the lead at the point where the crystals were attached.

If too much water is present and the acid becomes sufficiently weak to permit the formation of nitric acid in the chambers (by the reaction $2NO+3O+N_2O=2HNO_3$; or $N_2O_3+2O+H_2O=2HNO_3$) there results a loss of niter into the chamber acid and also serious corrosion of the lead walls of the chamber. This conditions is shown by the paling of the color of the gases in the chamber.

A rough indication as to the moisture condition in the chamber is obtained by the appearance of bell jars covering small openings in the chamber. A white crystalline covering of "chamber crystal" which turns green when moistened indicates a deficiency of moisture. Dripping moisture on the glass jars indicates too much water.

The acid formed in the chambers should not be weaker than 45° B. and should not be stronger than 54° or 55° B. In common practice the strength is usually about 52° to 54° B. The strength of acid in the back chambers is somewhat less than in the first, but even in the last chamber should not be less than 45° B.

TEMPERATURE CONTROL.

The reactions taking place in the chamber generate large quantities of heat, and this affects the temperature of the gases in the chamber more than any other factor. As a general rule the more rapidly the heat is carried away the better both for the process and for preventing corrosion of the lead. In the ordinary horizontal chambers whatever cooling is done is by radiation from the surface of the lead, unless cooling towers are interposed between the chambers. Cooling is very important and the proper relation between the cooling surface and the chamber capacity should be maintained. As a rule, every effort is made to facilitate radiation from the chambers. All chances for air to circulate around the chambers are usually given, and the outside of the lead is kept free from nonconducting surfaces. Many devices have been employed, some of which are described elsewhere in this paper, to dissipate the heat rapidly and thus also to increase the rapidity of the condensation of sulphuric acid mist.

The temperature of the gases in a chamber is a sensitive and reliable index of the activity of the process going on in the chamber.

A slight variation, even less than 3° C., in the temperature difference between two points in the chamber at some distance apart indicates a change of conditions which may lead to trouble, such as a variation in the sulphur dioxide concentration, a variation in the strength or quantity of the fresh niter supply, or nitrous vitriol, to the Glover towers, or fluctuation in the pressure of the steam or in the quantity of water being used. If the chambers are supplied with a gas containing a constant percentage of sulphur dioxide, nitrous oxides, and a sufficient and constant supply of steam or water, the process will remain constant and regular, as will be shown by the drips, color of the gas, and more than by any other way, by the temperature readings in each chamber. The gases usually enter the first chamber at about 90° C. and grow cooler as they pass through the succeeding chambers, leaving the last chamber at a temperature of not more than 30° to 45° C., according to the outside temperature. The temperature of every chamber diminishes from front to back, and, as stated above, the difference in the normal process ought to be constant.

NITER SUPPLY.

The percentage of niter or nitrogen oxides in the gases has great influence on the temperature without necessarily affecting the yield of acid or the consumption of niter. The simplest indication of niter conditions is the color of the gases. Thus, sight holes are provided at convenient heights in the chamber walls and in the exit pipe from the last chamber for observing the color of the gases. In the first part of the process the presence of a relatively large proportion of sulphuric acid mist prevents any color being observed. In fact, the presence of sulphur dioxide prevents the formation in any important amount of oxides of nitrogen other than the nitric oxides. As the gases progress through the chambers, the amount of reacting sulphur dioxide, and therefore of sulphuric acid mist, decreases, the greater proportion of the higher nitrogen oxides begins to color the gases a more or less reddish yellow. Before the gases pass from the chambers into the Gay-Lussac tower the red oxide (N_2O_4) is present in sufficient proportion to give a dark reddish color to the gases.

The supply of niter to the process—that is, the amount of nitrous acid in the chambers—may vary considerably without serious results. However, there are limits, both in regard to an over supply as well as to an inadequate supply. If too much niter is supplied the temperature rises too much, the chamber lead is acted upon and there is usually an unduly high loss through the Gay-Lussac towers. An excess of niter is evidenced by the chamber gases being too dark, by the presence of much nitrous acid in the chamber acid, and by the presence of nitric acid in the Gay-Lussac tower acid.

A deficiency of niter is more objectionable than an excess, by slowing down the reactions, causing a loss of sulphur dioxide and consequent decrease in production. This condition also causes loss of nitric oxide and nitrous oxide to the Gay-Lussac towers where these are not recovered. The result is an unduly large loss of niter from the system, to which is also added the loss of niter from the decomposition of nitrous vitriol in the Gay-Lussac tower by the sulphur dioxide. The deficiency is indicated by the paleness of the gases at the end of the chamber, the decreasing strength of the Gay-Lussac tower acid, and by a decrease in quantity or strength of drips. Red fumes of N_2O_4 in the Gay-Lussac stack, due to the decomposition of nitrous vitriol by the sulphur dioxide, may also indicate a deficiency of niter.

A method commonly employed for determining the niter conditions in the chambers is by determining the nitrosity of the chamber acid. An accurate quantitative determination of the nitrogen oxides and nitric acid can not be made readily, but a simple and quickly made colorimetrical test with ferrous sulphate is satisfactory for the purpose. Briefly described, the method is as follows: A sample of drip or chamber acid is obtained in a test tube and a solution of ferrous sulphate is poured in carefully so that the liquids are not mixed. If traces of the higher nitrogen oxides are present, a yellow ring is formed at the point of contact. The ring is darker and darker as the proportion of nitrogen oxides is greater until it becomes a deep brown or black. By practice and experience it is possible to get a fair idea of the niter conditions in the chamber by this test, in connection with the color of the chamber gas as observed through the windows.

As the nitrate of soda is the largest single item of expense in operating a chamber plant, much effort is directed toward the conservation and recovery of the nitrogen oxides. To this end the Gay-Lussac towers are used. However, even with the best types and method of operation of the Gay-Lussac towers for the recovery of these oxides, the efficiency of the towers largely depends upon the proper regulation of the water supply to the chambers, upon the efficient cooling of the gases in the chambers, and upon the careful introduction of just enough niter for the oxidation of the sulphur dioxide admitted to the chambers.

When the loss of niter is supplied by the Glover towers and by adding nitric acid or a prepared nitro-sulphuric acid mixture, such careful introduction of the amount of niter is possible. When the niter is supplied by the more or less intermittent method of "potting" the nitrate, there will be intermittent advance and retreat of the active zones of chemical action. In most plants, unless the niter feed varies widely, the chamber system is usually large enough to compensate for these variations and prevent the entry of sulphur dioxide into the Gay-Lussac tower.

CONTROL METHODS USED WHERE GASES ARE OF VARIABLE COMPOSITION.

As previously stated, the well-known and routine methods of controlling the process are based upon (1) observing the strength of the acid in the drips and the comparative nitrosity of the acid; (2) observing the difference in temperature at different parts of the chamber system and learning by experience what differences will yield the best results and bring about the best recoveries of nitrogen oxides in the Gay-Lussac tower, and (3) by observing the color of the gases in the chambers, or connecting flues, by means of "windows" or sights. These methods are satisfactory as long as the gases entering the Glover tower contain a substantially uniform percentage of sulphur dioxide. When the gas concentration is liable to vary widely, as in plants manufacturing acid as a by-product of zinc or copper smelting operations, this method of control is hardly adequate to yield the most economical results.

The Fairlie method of controlling the chamber process (U. S. patents 1205723 and 1205724) involves the establishment, as a result of experiment, of a series of desirable ratios between the percentage of sulphur dioxide in the gas entering the Glover tower and the percentage of sulphur dioxide in the front chamber, covering the entire range of sulphur dioxide percentages that are likely to be encountered, and in maintaining thereafter such desirable ratios constantly by introducing the right amount of nitrate of soda into the system. Once determined, the desirable ratios are arranged in a tabular form, the table being posted in a convenient place for reference by the chamber operator. An increase in the sulphur dioxide ratio above that desirable indicates the need of more niter, whereas a decrease below the desirable ratio indicates that the quantity of niter must be reduced. This method has been in use daily at the large acid plant of the Tennessee Copper Co., which has been operating on gases from copper blast furnaces.

Once the regularity of operation in the chamber is so greatly upset that the Gay-Lussac towers are not functioning properly, a certain loss of niter and sulphur dioxide is practically inevitable. The best method of correcting the trouble is to add sufficient niter in the Glover tower to make up for the decreased niter in the Gay-Lussac tower acid, in order to get things going normally again at the front of the chamber system. Gradually the normal condition will be resumed throughout the entire system and the Gay-Lussac towers will absorb the nitrous acid properly, by which time the whole plant will be back to a normal basis of operation.

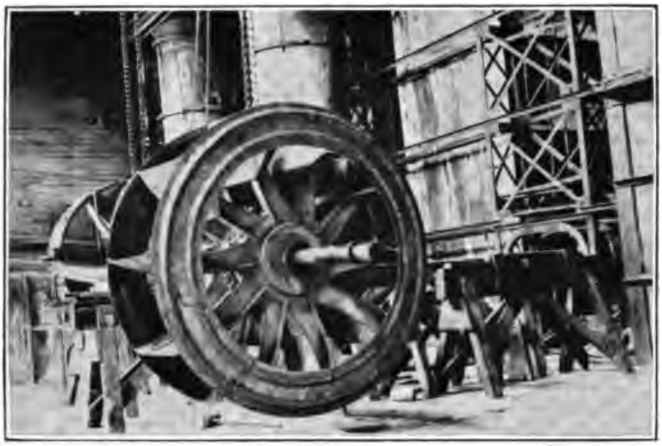
In order to increase the rate of reaction in the chambers and thus decrease the chamber space required, the "intensive" system has been tried. This system involves increasing the proportion of nitrogen oxides to that of sulphur dioxide in circulation and thereby accelerating the speed of the initial reactions. Intensive or high-pressure working leads to higher costs than a normal rate of production, owing partly to the comparatively great wear and tear on the chambers, and the increased consumption of nitric acid, hence can not be carried beyond a certain economic point. During the war many plants in this country used this method to increase the capacity of the plants. Plants ordinarily operating with a chamber capacity of 12 to 13 cubic feet per pound of sulphur treated daily and a niter consumption of 3.5 to 4 per cent, increased the production by decreasing the chamber space to 9 or 10 cubic feet per pound of sulphur, but at the same time at plants where the Gay-Lussac tower capacity was not adequate for the increased volume the niter loss was increased to more than 4.5 or 5 per cent. In some plants the wear and tear on the chambers was evidently increased, but in others, where sufficient cooling surfaces were present, the increase in depreciation was negligible.

The division of the initial volume of gases to two or more leading chambers in parallel instead of in series with a considerable reduction of the secondary chamber space, has been efficacious in reducing to some extent the total chamber space required. Such subdivision of the gas can be obtained easily or positively by the use of fans.

FURNACE DRAFT.

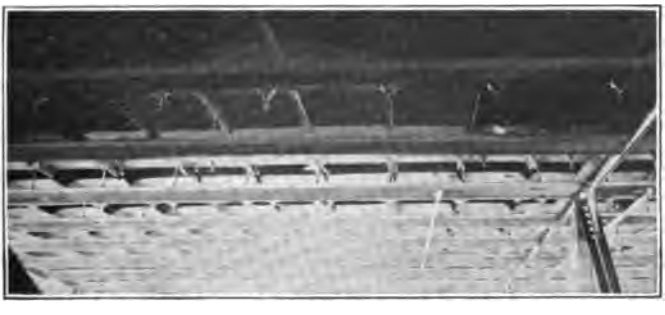
Nothing has yet been said in regard to the draft on the system and the means of moving the gases through the chambers and other apparatus. In an ordinary small plant where there is no fan employed to create the draft, the draft on the furnaces is produced (1) by the slight vacuum caused in the chambers and other condensing apparatus by the condensation of sulphur dioxide into sulphuric acid and by the contraction due to cooling of the gases, (2) by the tendency of hot gases to ascend, and (3) by the chimney, stack, or inspirator placed at the exit of the system.

However, the working of a plant on natural draft is not satisfactory, especially for a large plant, as this form of draft is dependent largely upon the regular operation of the plant and is seriously affected by adverse and changeable meteorological conditions.



A. FAN FOR DISCHARGING GASES THROUGH LEAD CHAMBER.

B. INTERIOR OF LEAD CHAMBER.



C. METHOD OF HANGING TOP SHEETS OF LEAD CHAMBER.

(By courtesy of the Mining and Scientific Press.)

In many plants a satisfactory and positive draft is maintained by a fan placed at the end of the chamber system to draw the gases through the entire system, even including the burners, and discharge them through the Gay-Lussac towers. This arrangement is feasible at a plant burning brimstone and where there are few or no intermediate towers. With many intermediate towers, or with a closely-packed Glover tower, the draft necessary to overcome the resistance caused by these towers would be so great that the chamber walls might be seriously collapsed. Therefore, in modern plants there is usually a fan between the burner and the Glover tower or between the Glover tower and the chambers, or the cooling towers before the chambers, to draw the gases from the burners through the Glover tower and to discharge them through the chambers. The fans used for this work are lead lined and have hard lead (antimonial lead) impellers. The vanes of the impellers (Pl. VII, *A*) are attached to the hub by cast-lead arms. Keyed to the cast-lead hub there is an inner hub of cast iron and to this is keyed the steel shaft. Some plants are provided with fans both before and after the chambers.

Modern installations permit adjustment of the speed of the fan within fairly wide limits and thus afford control of the draft on the furnaces to give the desired gas concentration, etc. As stated previously, the gases from a pyrite burner under good technical control will contain about 7.5 per cent sulphur dioxide and about 9 per cent oxygen, the rest being nitrogen and water vapor; the gases from a brimstone burner will usually have a sulphur dioxide content of 8.0 to 8.5 per cent. Such a gas mixture will contain sufficient oxygen to oxidize the sulphur dioxide to sulphur trioxide and also provide the necessary excess of 5 per cent oxygen for satisfactorily working the chambers.

CHAMBER CONSTRUCTION.

As in the last 10 years several construction companies in this country have made a specialty of chamber-plant construction and have developed special types suitable for different conditions and localities, it is not necessary in a paper of this character to discuss the construction of the chambers beyond outlining briefly some of the fundamental principles that underlie all chamber construction.

Chambers should always be placed at some elevation above ground level so that the bottoms are accessible for cooling and for observation to ascertain whether the chambers are tight. The chambers must therefore be supported by pillars, usually of brick or cast iron, or, in small plants, of wood.

The framework supporting and surrounding the lead walls of the chambers should be rigid. Most of the old chambers have a wooden supporting framework of vertical studding crowned with a wall plate rounded on the upper inside edge and beveled away outward below the round. The lead side curtains bend out over the round, are nailed down to the plate, and strapped to the vertical studding by lead straps. Seams are generally run vertically. Horizontal joints are made so that the upper sheet overlaps the lower on the inside, thus preventing leakage. The bottom sheets are laid across the chamber bottom and turn up inside and over a rim of side boarding 18 inches to 20 inches high. The side curtains usually are not attached to the bottom sheets, but the bottom edges of the side curtains are low enough to dip into the pool of acid maintained at the bottom. The ceiling lead is hung by lead straps to beams laid above. The ends of each ceiling extend out over the side sheet and are burned into the side sheets. Plate VII, *B*, shows an interior view of a lead chamber.

Most constructors now prefer steel framing with the chamber tops suspended from the roof of the building.

As variations in temperature expand and contract the lead walls, these should have curved corners and movable attachments to the framework to permit movement without buckling or bending of the sheets, particularly at the joint.

For bottom sheets, 8-pound lead is most commonly used, the edges being burned together. For side walls, 6-pound lead is used. The seams are burned with the sheets lying flat, and the whole section is then raised into position and the laps between successive sections are burned together. The top is usually of 6-pound lead. The method of hanging the top sheets in a plant of recent construction is shown in figure 7 and Plate VII, *C*. Lead straps are burned upon the 6-pound top sheets, and are turned to form an eye to receive a ½-inch iron bar, on the end of a threaded hanger with a special nut or washer resting on a pair of adjacent angle bars.

An average design of chamber affords a radiation surface of 10 to 15 square feet per 100 cubic feet of capacity, but, of course, the smaller the cross sections are in proportion to the length, the greater the radiation from a chamber. English practice provides about 20 square feet of radiating area per 100 cubic feet of volume capacity.

Flues for connecting chambers one with another, or for connecting chambers to an intermediate tower, may be circular or rectangular in cross section, according to the convenience in engineering. Experience has indicated that the height of the point of outlet or inlet of the gases is of no great consequence, as the natural circulation of the chambers is set up regardless of height of inlet and outlet.

The points in the chamber lining most severely attacked are usually around the entrances, where the reactions are more active than in other parts. Points not cooled by the outside air, such as the inner sheet of a lap joint, or points in contact with the timber framework are also subject to severe deterioration. Laying the chamber bottom on a slotted floor permits radiation of heat from the bottom sheets and serves to protect them. Most plants, however, carry considerable acid in the bottom, which, of course, protects the bottom sheets.

Acid storage tanks are usually provided beneath the chambers.

There are two special types of chamber plants in this country which should be mentioned briefly—the Falding high chamber and the Meyer tangential chamber.

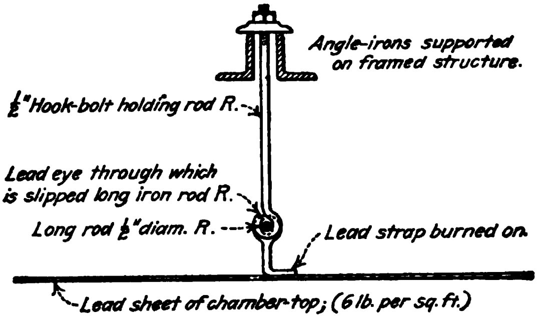

Angle-irons supported on framed structure.
½"Hook-bolt holding rod R.
Lead eye through which is slipped long iron rod R.
Long rod ½"diam. R.
Lead strap burned on.
Lead sheet of chamber-top; (6 lb. per sq. ft.)

FIGURE 7.—Method of hanging top of lead chamber at a plant in Arizona. (By courtesy of Mining and Scientific Press.)

FALDING HIGH CHAMBERS.

The Falding high chambers, designed by F. J. Falding, were built to utilize as far as possible the mixing of the gases by the convection currents set up by the heat of the chamber reactions, and at the same time to maintain a zone of great chemical activity in the upper part of the chamber. If the chamber is high, the hot reacting gases will tend to rise and to remain at the top of the chamber so long as the reactions go on. The inert, nonreacting, nonheat-producing and therefore cooler gases tend to fall to the bottom of the chamber. The object aimed at was so to proportion the height and area of the chamber to the volume of gas admitted that there would be ample time and provision for the quantitative carrying out of the reactions, with the result that the gas drawn from the bottom would consist entirely of nitrogen oxides, inert nitrogen, and some oxygen. As the gases would leave the chamber too moist and too hot to permit their direct admission to the Gay-Lussac towers, they must be dried and cooled by a water-cooled tower situated between the chamber and the Gay-Lussac towers. The first plant of this type was built at Vandergrift, Pa.; the plant comprised one chamber 50 feet square by 70 feet high, one Glover tower, two Gay-Lussac towers, and a small unpacked cooling tower 9.5 feet square by 50 feet high between the chamber and the Gay-Lussac towers.

At the plant of the Cleveland Cliffs Iron Co., at Marquette, Mich., there is one chamber 50 feet square by 70 feet high. The cooling towers, of which there are two, between the chamber and the Gay-Lussac tower, are 10 feet in diameter by 50 feet high. The capacity of this chamber plant is about 40 tons a day (50° B. basis).

The original acid plant at the smelter of the Tennessee Copper Co., at Copperhill, Tenn., comprises the largest installation of Falding chambers ever built. At that plant there are 11 chambers 50 by 50, by 67 feet high; 6 chambers 50 by 50, by 72 feet high; 4 chambers 22 by 50, by 77 feet high; 4 chambers 10 by 50, by 67 feet high: and 5 chambers 67 feet high but of varying lengths and breadths. The total chamber space in this set of chambers is 3,944,000 cubic feet.

As the chambers at the Tennessee Copper Co.'s plant are operating on blast-furnace gases, which vary greatly in composition, it is not possible to compare the results obtained with those obtained at other plants.

The greatest advantage of the Falding chamber is, of course, the great saving in lead. It is estimated that in the erection of a plant to contain 175,000 cubic feet chamber space, the Falding chamber will require 141,000 pounds of lead, and the usual rectangular horizontal chamber will require 240,000 to 300,000 pounds. There is also a considerable saving in ground space, which at some plants is a decided advantage. However, the cost of constructing the high chambers is greater than for the horizontal chambers, and the net saving in the total cost in most instances would be negligible.

No provision is made for obtaining an intimate mixture in the Falding chamber, other than the preliminary mixing brought about in the Glover tower and by the convection currents in the chamber, and no adequate means is provided for the condensation of the acid mist. Nevertheless, the results at the plants mentioned have been satisfactory; that is, there has been as complete a conversion of the sulphur dioxide, and the chamber space required has been as low, as at most horizontal plants; also the niter consumption has been reasonably low.

MEYER TANGENTIAL SYSTEM.

The Meyer tangential chamber is designed both to mix and to cool the reacting gases at the same time. The chamber is cylindrical in form, having approximately the same diameter as height. The gases enter the chamber at a tangent near the upper part and leave the chamber through outlet pipes built in the center of the floor. The first chambers have water-cooled lead pipes suspended around the circumference, which aid to reduce the temperature of the gases. The spiral motion of the gases tends to mix them thoroughly, and this mixing, with the cooling of the gases by the lead pipes, serves to accelerate the reactions somewhat above the average rate in the ordinary horizontal chambers. Many ordinary horizontal chambers give as good results, however.

At the plant of the Griffith & Boyd Co., in Baltimore, Md., the Meyer chambers were 33 feet in diameter and 35 feet high.

At the plant of the Mountain Copper Co., at Martinez, Calif., the chambers were 39.4 feet in diameter and 42.6 feet high. A recent plant built at Fairmont, W. Va., has a chamber 46 feet in diameter and 70 feet high over all. The gases are delivered tangentially by three flues, 19½, 27, and 34½ inches in diameter, respectively, at a height of about 40 feet. The gases issue from the bottom of the chamber in three discharge flues, symmetrically situated, each flue being 20 inches in diameter. These flues discharge into a cooling tower 9 feet in diameter and 70 feet high, which acts as a cooling flue and spray catcher.

SPECIAL TYPES OF INTERMEDIATE OR REACTION TOWERS.

The conversion of sulphur dioxide into sulphuric acid takes place very quickly in the front part of the first chamber, nearly 70 per cent of the total reaction taking place within the first chamber and in the Glover tower. Then the reaction becomes slow and is again revived when the gases pass on into the next chamber. The increase in the rate of reaction as the gases pass from one chamber to the other is due partly to the increased mixing and partly to the gases and the mist particles coming into contact with cooled surfaces of lead. In this way the particles of nitrososulphuric acid mist, or particles of acid containing the nitrososulphuric acid, come into direct contact with the particles of cooled and condensed water mist, forming sulphuric acid and releasing nitrogen trioxide. Mere mixing of the gases alone will aid in the reaction, but by bringing the gases into contact with cooled surfaces, this reaction is even more efficiently brought about and the nitrogen trioxide more rapidly released for carrying on the process. The older authorities give many descriptions of various mixing appliances, ranging from Ward chambers partly filled with sheets of glass to Lunge plates, which are packed into columns inserted between the chambers.

Among the most practicable equipment used in the acid plants of this country for increasing the rate of mixing of the gases and for precipitating or condensing the mists of nitrosulphuric acid and water as fast as they are formed are the following: Lunge plate tower; Gilchrist pipe columns system; Pratt converter system; Hoffman intensifiers; intermediate towers between chambers, as built by Chemical Construction Co.; and Anaconda "packed cell" system.

LUNGE PLATE TOWER.

The Lunge plate tower was one of the earliest developments of the intermediate "reaction" towers, designed to effect a constantly renewed mixture of all the gases, vapors, and misty particles, and to present large surfaces against which the gaseous current must strike in its course from one chamber to another. Described briefly, the plate tower comprises a lead tower, which may be either cylindrical or rectangular, filled with a series of perforated plates laid horizontally and spaced at some distance above the other. Each layer of plates is supported independently of the others. The plates are so constructed and placed that the holes in those of one layer do not come directly above the holes in the next layer below. As the hot chamber gases pass upward through the perforations in the plates they come into contact with dilute sulphuric acid splashing downward and also passing through the holes in the plates. The film of dilute acid over the plates presents an immense cooling surface to the gases and at the same time furnishes the water necessary for the decomposition of the nitrososulphuric acid.

The great disadvantage of this tower is its comparatively small cooling area and the high resistance that it interposes to the passage of the gases. A fuller description of the plate tower may be had by referring to Lunge's book.[a] None of the modern plants in this country are equipped with plate towers.

GILCHRIST COLUMNS.

The Gilchrist pipe-column system for accelerating the chamber-process reaction was devised and patented by Peter S. Gilchrist, now president of the Chemical Construction Co., Charlotte, N. C. The columns are approximately 4 feet by 3 feet 6 inches by 15 feet high; are made of 9-pound or 10-pound lead, are supported in a wooden or steel frame placed about 2½ feet above the floor level; and are built between the chambers, two or three to each chamber. The cubical content of the columns amounts to approximately 0.8 per cent of the total chamber space. The columns are filled with horizontal oval or angle pipes, with the outside deeply corrugated, so as to form recesses for acid on the top of the pipes. These deep corrugations increase the surface of the pipe for the gases to impinge upon, and offer greater obstruction to the gases as they wind their way upward through the columns. The pipes are staggered so that the course of the gases is continually interrupted as they reach each layer of pipes. The recesses or saucers formed by the corrugations on the top of the pipes fill with moisture or weak acid which overflows down the sides, cascading from pipe to pipe. On account of the continual and rapid mixing of the gases, the contact with the surface of the pipes, and with the weak acid flowing down over the pipes, the reactions take place quickly. There is always an excess of nitrous gases present, still further intensifying the rapid formation of the sulphuric acid. At the same time the gases are thoroughly mixed before entering the following chamber.

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[a] Lunge, George, Sulphuric acid and alkali, vol. 1, pt. 2, ed. of 1913, pp. 656-673.

The intensive chemical reactions generate considerable heat which is carried off by cold air being drawn through the horizontal pipes by a natural stack draft. The acid produced runs down and through the converter into the chamber pan.

Pipe columns are installed at the plants of the F. S. Royster Guano Co. in Norfolk, Va., Columbia, Ga., Macon, Ga., and Baltimore, Md.; Morris Fertilizer Co., Atlanta, Ga.; Lowell Fertilizer Works, Lowell, Mass.; Mutual Chemical Co., Jersey City, N. J.; Standard Acid Works, Baltimore, Md.; Baugh Chemical Co., Baltimore, Md.; Maybank Fertilizer Co., Charleston, S. C.; Georgia Fertilizer Co., Columbus, Ga.; Robertson Fertilizer Co., Norfolk, Va.; Roanoke Guano Co., Roanoke, Ala.; Standard Acid & Fertilizer Co., Troy, Ala.; and others.

With this system the average plant can work very easily on 10 cubic feet of chamber plus tower space per pound of sulphur burned per 24 hours when burning pyrite, and can operate on 9 cubic feet when burning brimstone. Occasionally an even higher chamber-space efficiency is obtained.

PRATT CONVERTER SYSTEM.

The Pratt converter system was devised by N. P. Pratt, chemical engineer, of Atlanta, Ga., and patented in 1900 (U. S. patents 546596 and 652687). The patents have expired, but the Pratt Engineering Co., of Atlanta, Ga., has continued to make a specialty of building plants along lines similar to those of the original patents. An excellent description of the original investigations leading up to the establishment of the system is given in the American Fertilizer.[a]

For the operation of the Pratt system at a plant having a capacity of about 60 tons of 50° B. acid per day, the general plan would be about as follows: A total chamber space of about 240,000 cubic feet would be provided, in three or four chambers, of which the first carries 80 per cent or 190,000 cubic feet. The other chambers have equal capacity, the main duty of these being to cool the residual gases on their way to the Gay-Lussac towers, and at the same time to trap and precipitate any acid mist that might pass to them. A lead-walled shaft or "converter" about 25 feet high and about 25 square feet square is installed near the rear of the first chamber. This shaft is packed with broken quartz, about the size of a man's fist or smaller, to within 18 inches of the top, the quartz packing resting upon grated chemical brick which rise about 2 feet above the pan. Through a wide, flat entry flue, connecting with the rear of the first chamber, part of the gases from the chamber is taken into the column just above the pan, the gases being drawn through the quartz-packed column by a large regulus metal or lead exhauster. The exhauster discharge may enter either the first chamber at the head or the flue leading from the Glover tower. If a fan is used to draw the furnace gases through the Glover tower and to discharge them into the first chamber and has sufficient capacity, the lead flue from the top of the quartz-packed column or "converter" can be connected directly into the flue from the Glover tower; then by suitable dampers in the Glover tower flue and the flue from the "converter" the relative volume of the gases from the two flues can be varied, giving a perfect control over the process. A flue from the front corner of the first chamber connects with the front of the second chamber, and the volume of gases passing from the first into the second is controlled by natural draft or by a fan at the end of the chamber system with capacity to carry through the chamber system the normal volume of gas. Thus, while the plant is in current operation, and is regulated in the usual way, the gaseous and misty contents of the large first chamber are moved rapidly through the length of the chamber and then pass up through the quartz packing of the converter, this movement being independent of and without any interference with the ordinary draft. The circulating capacity of the exhauster is much greater than the ordinary volume of gases coming from the Glover tower.

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[a] Pratt, N. P., The N. P. Pratt converter system for the manufacture of sulphuric acid: American Fertilizer, vol. 13, July, 1900, pp. 33–42.

The water required for the process, except that supplied by the Glover towers, is usually supplied by feeding it under the brick grating of the quartz-packed column and at no other point.

If the volume of gases passed through the "converter" and circulating pipes is about 9,000 cubic feet per minute it is evident that with a main working chamber volume of 160,000 cubic feet a volume of gases equal to the entire content of the main chamber passes through the "converter" every 18 minutes. As a result of this intimate mixing in the chamber and the contact of the acid mist and water mist against the quartz packing of the column all the chamber process reactions are accelerated and the activity of the nitrous acid (N_2O_3) is increased.

Plants equipped with this system have been operated with as low a chamber space as 7 cubic feet per pound of sulphur, to which, of course, must be added the volume of the flues, etc., in the system, making a total requirement of a little more than 7.5 cubic feet. The average plant on this system requires between 8.5 and 9.5 cubic feet of chamber space when treating a steady supply of gas of fairly high concentration, as from brimstone. Such results have been obtained with a yield of 4.8 pounds of 50° B. acid per pound of sulphur per 24 hours and with a niter consumption of 3.5 per cent, based on the weight of sulphur burned. The use of the Pratt system, of course, requires excess power above what is required at any ordinary chamber plant.

Most of the plants operating with the Pratt converter system are in the South, but in the last few years a number of such systems have been installed in the North, chief among these northern plants being the Armour Fertilizer Works, Chrome, N. J., and the Butterworth Judson Corporation, Newark, N. J.

INTERMEDIATE TOWERS BUILT BY CHEMICAL CONSTRUCTION CO.

The intermediate towers designed by the Chemical Construction Co. are lead-lined towers, with steel frames and packed with 6-inch "chemico" spiral rings, as described on page 87. The 6-inch rings have a surface area of 27 square feet per cubic foot of packing, with 60 per cent free space for passage of the gases. The rings are placed in the tower in layers, each layer being staggered. The gases pass up through the rings largely in a spiral motion, thereby remaining in the tower longer than with a direct line of travel, and at the same time causing the up-going gases and the down-coming acids to remain in contact with each other for a long time and over a large surface.

With this type of packing there is claimed (1) intensive mixing of the gases, owing to the whirling motion imparted, (2) large contact surface, (3) large free space, and (4) durability. The whirling motion evidently is not perfect, as there is a space about three-fourths of an inch in diameter through the center of each ring, through which gases and liquids may travel vertically without going around the spiral, also spaces between the adjacent rings permit the vertical flow of acids and gases.

The acid formed in the tower runs down the surface of the spirals and sides of the rings, keeping the surfaces always moist. Water sprays are used in the inlet pipes to keep the strength of the acid down to a normal working basis, as otherwise the strong acid would absorb the nitrous oxides present. On account of the large area of surface exposed and the intimate mixing of the gases by the spiral motion, the reaction in the tower is vigorous and a relatively large amount of acid is produced.

These intermediate towers have been installed at the plant of the Alabama Chemical Co. at Montgomery, Ala., and of Swift & Co. at Harvey, La.

The following data has been furnished by the Chemical Construction Co. relative to the work of the intermediate towers at the Swift & Co. plant:

Data on intermediate towers at Swift & Co. plant.

	Cubic feet.
Total chamber space in five chambers	268, 500
Intermediate towers between each chamber (28 feet high by 6 feet wide by 24 feet 9 inches long), each	4, 158
Volume space in four intermediate towers	16, 632
Tower at rear of last chamber (14 feet high by 5 feet wide by 15 feet 3 inches long)	1, 068
Total cubic feet in towers	17, 700

Ratio of tower volume to chamber volume $=\frac{17,700}{268,500}=6.5$ per cent.

Ratio of open space in towers to chamber space $=\frac{17,700\times0.60}{268,500}=3.9$ per cent.

First tower—that is, the one between the first and second chambers—produces 16,905 pounds of 55°B. acid at 197° F., or 21,064 pounds 50°B. acid, equivalent to 4,434 pounds of sulphur.

Efficiency of first tower, therefore, is $\frac{4,158}{4,434}=0.938$ cubic feet of tower capacity per pound of sulphur burned daily.

Total amount of 50°B. acid produced in five towers is 60,700 pounds, equivalent to 12,900 pounds of suphur. Tower capacity required per pound of sulphur converted per 24 hours in total tower installation, is 1.37 cubic feet.

Total production of entire plant is 180,000 pounds of 50°B. acid per day.

Amount made in towers, 60,000 pounds, equivalent to 33⅓ per cent.

Amount made in chambers, 120,000 pounds.

Efficiency of chambers alone is 10.7 cubic feet per pound of sulphur burned per 24 hours.

Total efficiency of whole plant—that is, chamber plus tower capacity—is 7.6 cubic feet per pound of sulphur.

The Chemical Construction Co. are now designing towers of much larger capacity than those described, and at the same time reducing the chamber capacity proportionately. The towers are designed to have a height of about that of the chambers, a width of 5 to 10 feet, and length according to the work required. The special rings are made of chemical and acid proof brick and are claimed to be practically indestructible.

Figures 8 and 9 show the types of plant with the intermediate towers recommended by the Chemical Construction Co. It is to be noted that the arrangement is similar to that recommended by practically all construction companies and common to all modern plants—that is, the roaster, dust chambers, niter ovens, the Glover tower, and the Gay-Lussac towers, are all concentrated at one end of the plant. Thus, in a six-chamber plant the gases after passing ahead through three lead chambers, double back through the other three chambers parallel to the first three, to the Gay-Lussac towers. This arrangement facilitates technical control as well as convenience in operation.

It is evident that the main consideration to be given any scheme for intensifying or increasing the rapidity of the reactions in the chamber process is whether or not the increased cost of installing and operation as compared with the cost for an ordinary chamber plant is justified by the results obtained. In other words, it is not so important to obtain a high conversion factor per unit volume of chamber, or tower space, as it is to obtain the largest conversion per unit cost of investment or of operation. At certain skillfully operated plants, equipped with ordinary chambers without any intermediate towers other than cooling towers, results obtained have been nearly if not just as satisfactory as those obtained at other plants equipped with intensifiers or intermediate towers, but less skillfully controlled.

ANACONDA "PACKED-CELL" PLANT.

At the acid plant of the Anaconda Copper Mining Co., at Anaconda, Mont., there has been developed during the last year a successful process for the manufacture of acid, called the "packed-cell" process. The main features of the process were devised by E. L. Larison, superintendent of the acid plant at Anaconda, who has applied for a patent. After experiments had been conducted on a laboratory scale, the process was tried out on a 2-ton scale. On the satisfactory performance of this 2-ton experimental plant the Anaconda company authorized the erection of a 25-ton plant, which has recently been completed and is now in successful operation.

In this new plant the lead chambers are entirely eliminated and in their place are substituted brick cells, or towers, packed with acid-proof brick or other packing to create vigorous mixing of the gases and mists, and to afford large surfaces upon which the gases may impinge. This packing is kept wet with cold sulphuric acid of such gravity that it will not take into solution the oxides of nitrogen. The acid carries off the heat of the reaction, and in fact, controls it. One of the causes for the nonsuccess of earlier forms of reaction

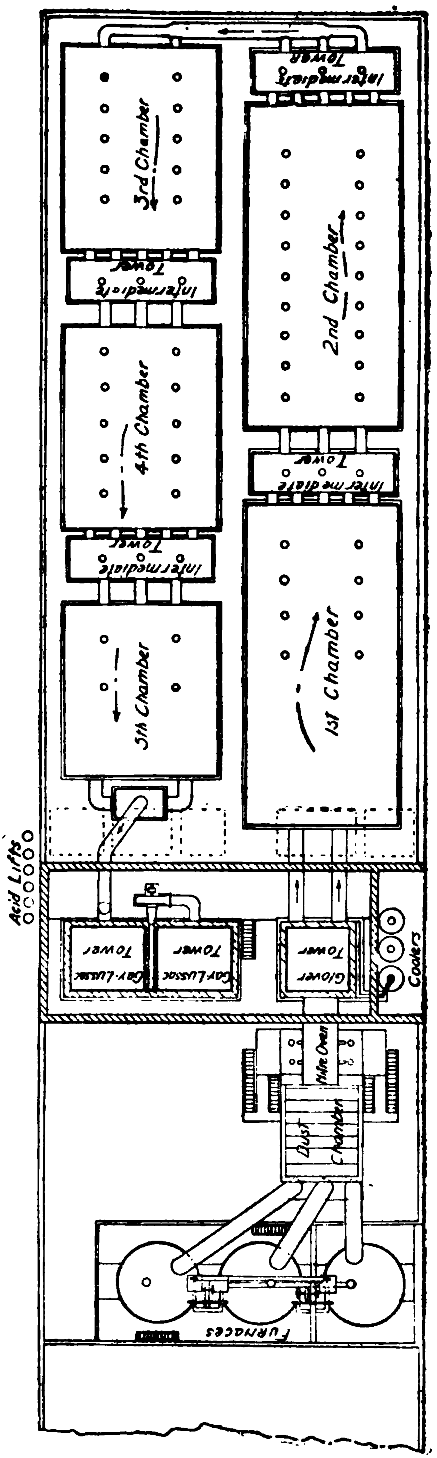


FIGURE 8.—Plan of chamber plant designed by Chemical Construction Co.

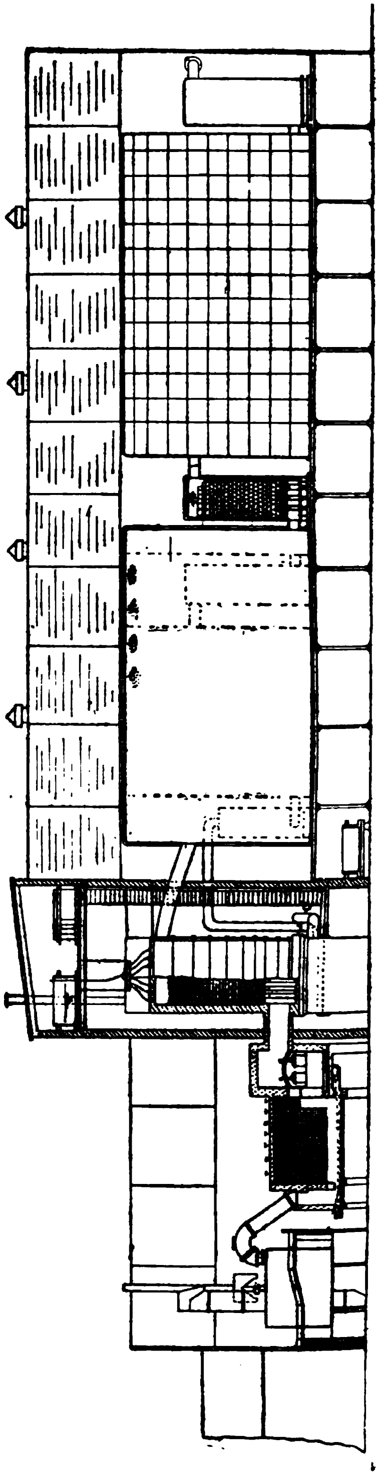


FIGURE 9.—Elevation of chamber plant designed by Chemical Construction Co.

towers was due to the inability to get rid of the heat generated in the towers. This feature has been solved at Anaconda by the large volume of acid being circulated, amounting to ten times the total acid made in the tower. The acid issues hot, is cooled, pumped up, and reintroduced. The tower capacity required is only about 1 cubic foot per pound of sulphur per 24 hours.

DESCRIPTION OF PLANT.

A brief detailed description of the plant, as given by the Anaconda Copper Mining Co., follows:

Flues and blowers.—The gas is drawn from the furnace dust chamber through a 24-inch asbestos-covered steel flue. The blower is a No. 11 Buffalo forge blower, provided with a water-cooled gland, where the shaft enters the case, and with water-cooled bearings. This blower runs at about 750 r. p. m. and is very satisfactory.

Glover tower.—The Glover tower is of standard dimensions and design. It is sheathed with lead. Splash-plate acid distributors are used. Two 4-foot by 4-foot by 4-foot coolers take the outflow. Each has four 1½-inch pipe coils.

Reaction towers or cells.—There are five reaction cells built in a block. They are sheathed with lead. They are packed with Anaconda slime brick of standard shape and size. Acid is made in them at the rate of about 1 pound of sulphur converted per cubic foot of packed volume. Each cell is provided with its individual acid-distributor system. The acid issues from each cell into a launder and is conducted to a set of coolers, then elevated by a centrifugal pump to the distributing box as needed. The gravity of the acid leaving the cells is maintained at such a point that it will neither absorb the nitrogen oxides nor the sulphur dioxide. The distributing and cooling arrangement permits good regulation of the gas temperature in each cell.

Gay-Lussac towers.—The Gay-Lussac towers, two in number, are built in one block with an interior downtake flue between them. The block is lead sheathed. The volume and general design is conventional. Splash-plate distributors are used.

The acid throughout the whole plant is pumped by Lewis vertical submerged centrifugal pumps with direct-connected motors. The pumps for the circulation of tower acid (that is, 60° to 61° B. acid) are of iron. The weak-acid pumps are lead covered. Iron tanks and pipes are used for the 60°–61° B. acid and lead for the weak acid. Four pumps are used, each equipped with a 5-h. p. motor; they have a large margin of excess capacity.

It should be mentioned that part of the rapidity of reaction is due to the use of more than twice the usual niter circulation, being nearly 70 parts of sodium nitrate per 100 parts of sulphur. This is possible on account of the temperature control that is effected in the reaction cells by means of the circulation of acid.

An unusual construction feature is in the manner of applying the lead and supporting it. Instead of building a strong steel frame and hanging the lead, and then putting in the masonry walls and packing, as is ordinarily done, the masonry was all erected first and then the lead applied. The lead sheets are attached to comparatively light framing, and this in turn is supported where necessary on corbeled shelves extending from the faces of the transverse walls. All heavy steel and wood columns are done away with and the lead is carried by the masonry, which is amply strong to support it.

The brick used for walls and packing is Anaconda slime brick, being made from the slime tailings from the concentrating mill. The mortar is made of 30° B. silicate of soda with 100-mesh "Dillon rock," a pure natural quartz quarried near by. The walls were laid carefully, but not especially so. The average rate of laying per day per mason was 800 brick. It was originally considered that such a plant might be built without lead sheathing, but it developed that absolutely tight walls could be built only by using the most perfectly uniform brick and by laying them with a degree of care and consequent slowness that made the cost far higher than sheathing with lead. Future plants may be built entirely with lead walls supported by steel framework, doing away with the interior brick walls.

Needless to say, no housing is necessary to protect the lead from wind and weather. A top house to protect the operator and a shed to protect the tanks and pumps are the only buildings necessary.

Figures 10 and 11 show the plan and elevation, respectively, of the 25-ton plant. Plate VIII shows the form of packing. Plate IX shows the 25-ton plant under construction before the brick walls were covered with the lead sheathing.

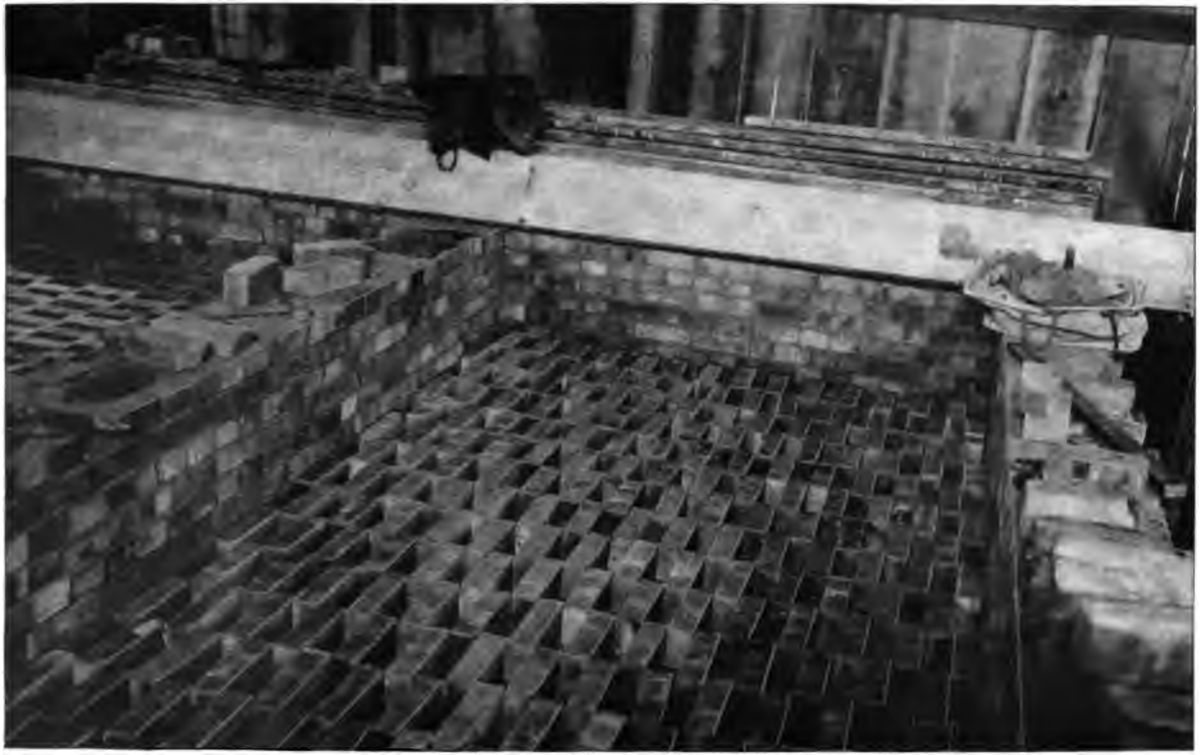
The 25-ton plant occupies a ground space of about 40 by 80 feet, including tanks, pumps, and other equipment.

OPERATION.

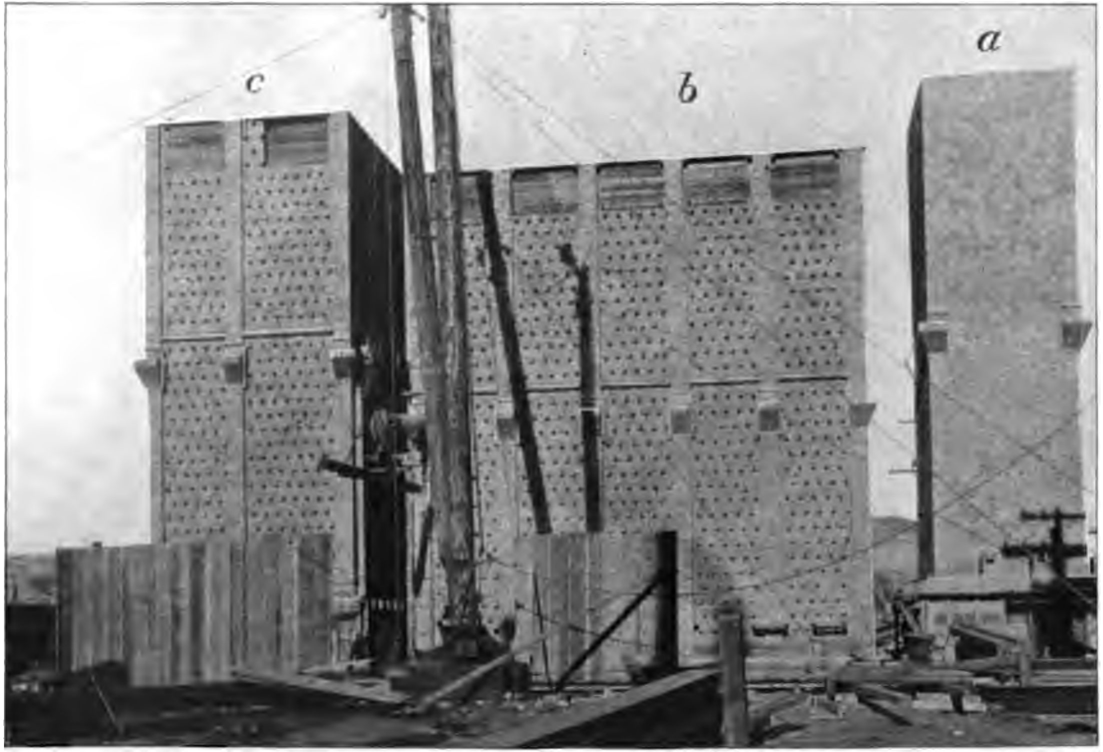
Operation is controlled by sulphur dioxide tests of the gases entering the first and fourth cells, and nitrous vitriol, temperature, and hydrometer tests at various points.

Control work is done by one man. A second man oils, cleans up, and acts as general factor of safety. It seems from the compactness and simplicity of operation of this plant that a 100 or 150 ton plant could be as readily handled by two men.

The niter consumption at the start of the operation of this plant has been considerably higher than with the ordinary plant, being about 6 per cent as against 4.5 per cent in the chamber plant close by. A large proportion of the consumption is due to mechanical losses, caused by fluctuations in the gas concentration. The niter loss is being gradually decreased as the best conditions as to cell temperatures and acid strengths are being determined. However, the reconversion of the lower nitrous oxides into the higher oxides, which are readily recovered by the Gay-Lussac tower acid, seems to require



VIEW OF TOWER OF ANACONDA ACID PLANT DURING CONSTRUCTION, SHOWING PACKING.



VIEW OF ANACONDA ACID PLANT DURING CONSTRUCTION, BEFORE TOWERS WERE COVERED WITH LEAD.

a, Glover tower; *b*, five packed reaction towers; *c*, Gay-Lussac towers.

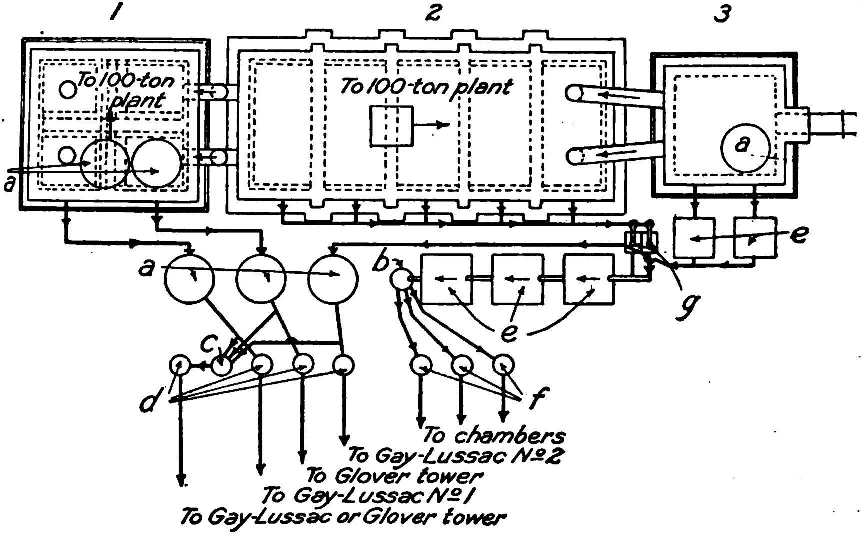


FIGURE 10.—Plan of Anaconda acid plant with packed tower: *1*, Gay-Lussac tower (2 compartments); *2*, chamber compartments; *3*, Glover tower; *a*, iron tanks; *b*, distributor; *c*, collector; *d*, iron pump; *e*, coolers; *f*, lead pumps; *g*, air lifts.

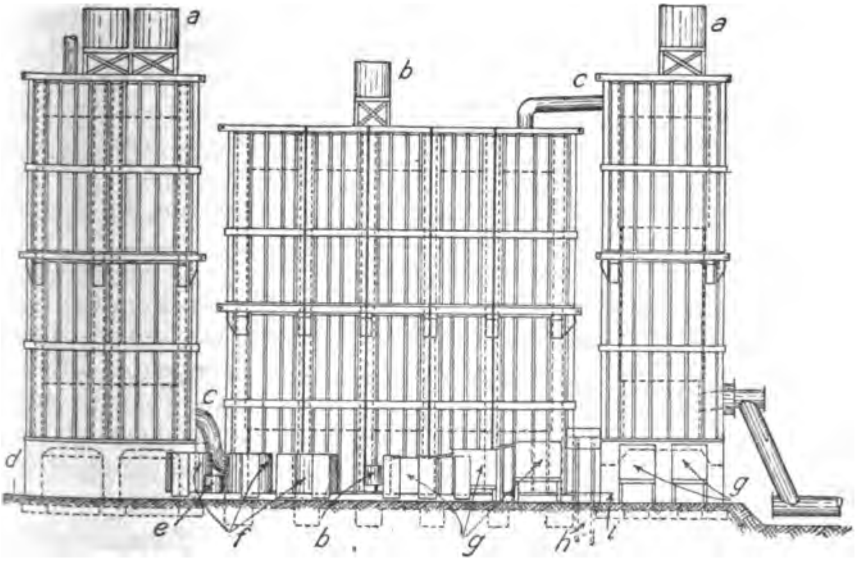


FIGURE 11.—Elevation of Anaconda acid plant with packed tower: *a*, circulating tank; *b*, distributor; *c*, lead flues; *d*, top of foundation for Gay-Lussac tower; *e*, collector; *f*, iron tanks; *g*, cooler; *h*, air lifts; *i*, top of chamber foundations.

some time, and the introduction of a chamber, probably of comparatively small capacity, between the reaction towers and the Gay-Lussac towers may be necessary in order to give the time required for a satisfactory niter recovery. Recent work has shown that the use of a third Gay-Lussac tower would increase the niter recovery to a point where the resulting loss would be normal.

The main advantage of this type of plant over the ordinary chamber plant is the decreased cost of construction. At Anaconda, where acid-proof brick can be made at a fairly low cost—about $8 per 1,000 with 1916 prices—and lead construction is relatively high, the cost of this type of plant is about 45 per cent of that of a chamber plant. At other points where the cost of brick is greater and the cost of lead construction less, the difference would not be as great, but the cost would in all cases be less than for a lead chamber of corresponding capacity. The cost of operation per ton of acid produced apparently will be about the same. The cost of maintenance of the packed cells remains to be demonstrated, but indications are that it will be less than that of maintaining a lead chamber plant.

GAY-LUSSAC TOWERS.

In order to recover the oxides of nitrogen issuing from the last chamber, the gases are led into Gay-Lussac towers where these oxides are absorbed by moderately concentrated (60° to 62° B.) sulphuric acid. Nitrous acid (N_2O_3) is absorbed with the formation of nitro sosulphuric acid. Nitric oxide (NO) is not absorbed except in the presence of oxygen when the higher nitrogen oxides are formed, hence the necessity of maintaining a certain proportion (about 5, per cent) of oxygen in the exit gases. Nitrogen peroxide (N_2O_4) is absorbed slowly by the acid with the formation of nitrososulphuric acid and nitric acid. When nitric oxide and nitrogen peroxide are present in the proper proportions and sufficient time is allowed for the reaction, the result is a nearly complete conversion to nitrous acid, which is readily soluble in sulphuric acid.

Some acid experts maintain that the presence of a certain proportion of sulphur dioxide is necessary in the exist gases from the last chamber in order to keep a sufficient proportion of the higher oxides of nitrogen reduced to nitric oxide to permit conversion of all the nitrogen peroxide to nitrous acid. In "forcing" the chamber and operating with a high niter circulation there may undoubtedly be considerable nitrogen peroxide in the gases, and unless the capacity of the Gay-Lussac towers is adequate to allow the longer time for absorption of the peroxide, it would undoubtedly be lost. This loss may be prevented by the presence of a small amount of sulphur dioxide to react with the nitrogen peroxide, as outlined above.

On the other hand, if too much sulphur dioxide is present in the gas mixture entering the Gay-Lussac towers, nitric oxide forms in excess of the quantity needed to form nitrous acid with the nitrogen peroxide, or in excess of what can readily be oxidized to nitrous acid. As nitric oxide is only slightly soluble in cold sulphuric acid of 60° B. strength, this excess will be largely lost, and as nitric oxide is a colorless gas, its loss will not be so readily detected by observing the gases escaping from the top of the tower.

CONSTRUCTION OF TOWERS.

Various styles of Gay-Lussac towers with different types of tower packing have been proposed. The most commonly used type is a lead tower much higher than it is wide, of circular or rectangular form, and filled with a tower packing, such as coke, quartz, or acid-proof stoneware. The packing is so arranged that the stream of sulphuric acid solution entering from above is broken into small drops or spray as it descends through the packing. The gases rise in numerous small streams, through the interstices of the packing, so that the surface of contact between acid and gas is as large as possible.

The capacity of the tower corresponds in a measure with the capacity of the chambers and also with the method of operation. Intensive working of the chambers, involving a high niter circulation, requires a larger tower capacity than a more moderate method of working. Thus, when the plant is so operated as to use 16 to 20 cubic feet of chamber space per pound of sulphur burned per 24 hours, a Gay-Lussac tower capacity equivalent to 2 per cent of the chamber space is usually sufficient. With more intensive working, the tower capacity must be increased, even to 3 or 3.5 per cent. These figures refer to the space occupied by the packing and the interstices, not to the total space in the lead shell. However, the efficiency of the Gay-Lussac tower is more largely dependent on the condition of the entering gas, as discussed previously, and upon the method of constructing and packing, than upon any absolute ratio of cubic content to chamber space. The distribution of the acid throughout the tower should be as perfect as possible.

With the large Gay-Lussac tower capacity required at many works, it is impossible to use only one tower. In many plants two towers are employed, the first being fed with the acid from the second. In both towers, the gases should ascend against the stream of acid.

Gay-Lussac towers, as previously stated, have recently been built of chemical brick laid in acid-proof cement (see fig. 12), in lieu of lead. In building towers of chemical brick the horizontal and vertical joints of the brick in the walls are staggered, and on the inside two layers of 6-inch by 6-inch tile are placed also with staggered joints. This method practically eliminates acid or gas leakage. In this construction the connecting flues between the brick towers are also of chemical brick in place of lead.

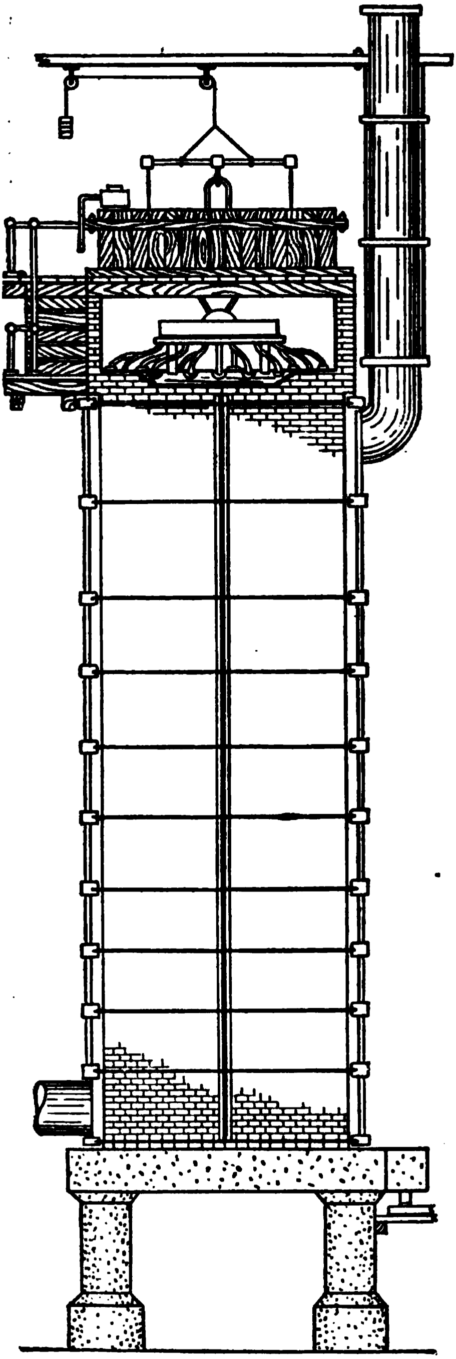
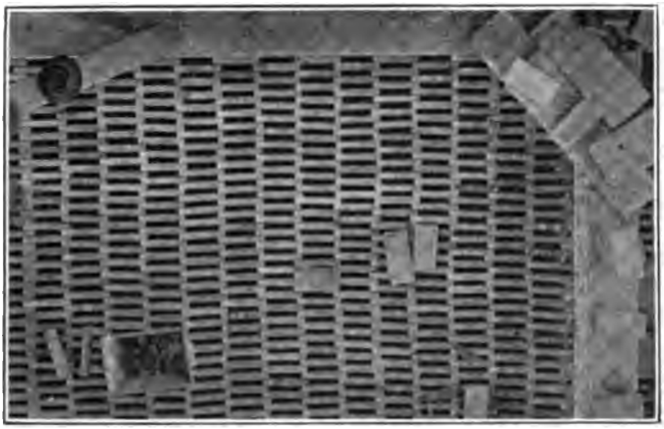


FIGURE 12.—Typical masonry, Gay-Lussac tower.

At the acid plant of the Calumet and Arizona Mining Co., a radical departure from the usual type of construction has been introduced. There are 12 towers built into a solid block, each tower being 13 feet square by 45 feet high. The towers are built of duro brick laid in duro cement, and the interior is packed with duro tile. (See Pl. X, *A*.) The entire block of towers is inclosed in lead sheeting, hung upon a steel frame. The stream of gases coming from the chambers is divided into three parts, each part passing independently through a series of four towers. The cold acid from the Glover tower is pumped to the top of the fourth tower, and travels counter current to the gases.

At the plant of the Tennessee Copper Co. is a Gay-Lussac tower of peculiar construction. There is only one tower for a series of four chambers aggregating 557,000 cubic feet of chamber space. This tower is built of acid-proof brick laid in acid-proof cement, without lead curtains. The tower is divided into 56 cells, the partitions being of acid-proof brick. There are eight parallel rows of cells and seven cells to the row. Each cell is 8 feet square inside, with a total height of 40 feet.



A. DURO TILE PACKING OF GAY-LUSSAC TOWER.

B. COOLING TANKS AT PLANT OF CALUMET & ARIZONA MINING CO.

(By courtesy of the Mining and Scientific Press.)

The gases traverse the eight rows in parallel, passing up one cell and down the next until they arrive at the top of the seventh cell, when they are drawn through the back fan and discharged into the exit stack. The acid is distributed over the tops of the cells by means of a single acid feed pipe to each cell, terminating inside the tower in a sprayer provided with a splash plate that sprinkles the acid with approximate uniformity over the entire top of the tower packing. The lead pan at the bottom is divided into three compartments by means of brick partitions whereby it is possible to keep separate nitrous vitriol of three different grades of nitrosity, as discharged from the tower. The 56 cells are divided into three series, as to the circulation of acid—the first having 24 cells, the second and third having 16 cells each—and the acid in the three compartments progresses forward through these series.

No advantage from this type of construction has been experienced, and, in fact, owing to the difficulty in the working of the cells when they become clogged, they have been rather disadvantageous to operate.

One of the advantages in operating two or more towers in series is that if any irregularity occurs in the chamber operations whereby some sulphur dioxide is admitted into the first Gay-Lussac tower, the nitrous and nitric oxides escaping as a result from the first tower can be recovered in the second. A tower of considerable height would of course accomplish the same result but the expense of building such a tower would be too great.

PACKING.

It has been the general custom in the past to pack the towers with coke, using hard-burnt oven coke. Soft, porous coke is not satisfactory, as it can not support the pressure of the column and is acted upon by the nitrous vitriol too readily. In fact, even hard-burnt coke is slowly acted upon by nitrous vitriol, or by the nitrous or nitric acid, and so deteriorates in time that the towers must be repacked. Some coke towers require repacking every year. The efficiency of coke packing has been rather overestimated, for, as a matter of fact, the pores of the coke become filled with acid so that only the exterior of the lumps remain effective in presenting a film of acid to the gases. Tile, such as duro tile, and special chemical earthenware shapes, such as the "chemico" spiral rings, are now being largely used.

ACID SUPPLY.

The supply of cold acid to the Gay-Lussac tower should be as regular and as evenly distributed over the entire cross section as possible. Various devices are employed for this purpose, which need not be described here. The most commonly used is the "splash plate" distributing device. The acid is usually pumped into storage tanks built at a high elevation, and thence to the distributors, or may be pumped directly to the distributors. The supply is so regulated that the nitrous vitriol, coming from the bottom of the Gay-Lussac tower nearest to the chamber, will have in solution an amount of N_2O_3 equivalent to 40 to 60 ounces of sodium nitrate per cubic foot of acid. The nitrous vitriol should not contain less than 1 per cent N_2O_3, or the equivalent of 36 ounces $NaNO_3$ per cubic foot of acid. Above a strength of 2½ per cent N_2O_3, or the equivalent of 90 ounces per cubic foot of acid, there is some danger of a loss of niter from the acid.

From the Gay-Lussac tower the nitrous vitriol is pumped into storage tanks for feeding it to the Glover tower.

EXIT GASES.

The exist gases issuing from the Gay-Lussac towers, when ample tower capacity is provided, are never free from sulphur dioxide or nitrogen oxides. Usually the gas issuing from the tower has an orange color, which is probably due to the oxidation of some residual nitric oxide (NO) to nitrogen peroxide (N_2O_4) in contact with the air. With a single Gay-Lussac tower there is also some slight loss of nitrous acid (N_2O_3) due to the vapor tension of nitrous acid or of nitrososulphuric acid in sulphuric acid.

NITER SUPPLY.

From the formulas representing the chamber process reactions it would appear as though, once sufficient niter was added to the plant further quantities would not be required. However, for various reasons, there is a loss, and it is necessary to replenish the supply.

The quantity of niter lost in the working of a chamber plant varies greatly, depending largely upon (1) the adequacy of the Gay-Lussac tower capacity with regard to the chambers and to the intensity of working, (2) the regularity of the supply and concentration of the gases from the burners or other source of supply, and (3) the skill of the operators in maintaining regular and controlled reactions in the chambers. Even with the best practice there is always some loss, partly mechanical and partly chemical. The mechanical loss is caused by small amounts of some of the oxides being carried through the Gay-Lussac towers by the waste gases; also a small amount is lost by solution in the chamber and Glover tower acid. The chemical loss is due to the formation of oxides which are not dissolved in the acid.

In average practice in this country, when running on a good grade of pyrite or a brimstone, the niter loss is around 4 per cent of the sulphur burned. At a number of plants the consumption is less than 4 per cent, and claims have been made that certain plants have been operated for a period of months with less than 2 per cent niter consumption. A niter consumption of around 3 per cent may be taken as very good practice.

At plants utilizing waste gases from metallurgical operations, the niter consumption is frequently much higher and at one plant has been as high as 8 or 9 per cent for long periods, this being due to the widely fluctuating composition of the gases.

As has been already stated, the ideal method of introducing the necessary niter to make up for that lost is by "potting" the niter, allowing the distilled nitric acid to be absorbed by sulphuric acid maintained at a temperature to prevent loss of nitrogen oxides, and then adding this mixture to the Glover tower. Another method is to add the nitric acid directly to the Glover tower.

The common method of adding the niter is to "pot" it, the nitric acid being introduced directly as vapor into the gases as they pass along the flues leading to the Glover tower. Usually the nitric acid vapor is generated in cast-iron pots placed in an enlarged part of the main flue, called the "niter oven," suitable supports for the pots being provided. Nitrate of soda and sulphuric acid are charged into the niter pot and the reaction between the two is aided by the heat of the gases. Shallow cast-iron pans are usually provided below the pots to catch the material that boils or slops over. The nitric acid gas issuing from the pot is converted into nitrous acid gas by the sulphur dioxide in the gases. The liquid residue, "niter cake" ($NaHSO_4$, or a mixture of Na_2SO_4, H_2SO_4 and $NaHSO_4$), is tapped through pipes provided for the purpose into molds. The use of this niter cake is discussed in a subsequent connection (p. 207). The main disadvantage of this method of adding the niter is the fact that the niter is added in large "doses" at intervals. In a large plant, of course, where a number of pots are used, the charging and discharging of the pots can be so regulated as to produce a fairly constant and regular supply of the nitrous oxides.

In some plants, the standard retort as used in the manufacture of nitric acid is employed, these retorts being placed outside the flue and fired with coal.

At the plant of the Tennessee Copper Co. the retorts are 10 feet high and 8 feet in diameter, large enough to cook a charge of 8,000 pounds of nitrate of soda. The nitrate is fed automatically and at the same time the sulphuric acid is added in the requisite amounts by an automatic feeder acting in conjunction with the nitrate feeder.

In the manufacture of nitric acid for commercial purposes a certain proportion of the nitric acid produced is too weak or too impure to be marketable. There is also a considerable loss of non-condensed oxides of nitrogen both in the manufacture of nitric acid and of mixed acid, which can best be saved by passing the first exit gases through a scrubber or tower and absorbing the contained nitrous acid in sulphuric acid, forming nitrous vitriol. This weak or impure acid and the nitrous vitriol can be utilized for supplying the chambers with nitrous acid gases by means of the Glover towers.

Nitrous acid gas from various chemical works, and the spent acid from other industries, can be run into the Glover tower and utilized.

COOLING TANKS.

The sulphuric acid from the bottom of the Glover towers will be hot, usually about 120° to 130° C., and in some instances when the furnace gases are especially hot and the volume of gases is large for the Glover towers the temperature may be 150° C. This acid must be cooled before storage or before being used in the Gay-Lussac tower for the absorption of nitrous oxides. For this purpose, cooling tanks or worms are usually placed near the Glover towers on a level below the bottom of these towers, so that the acid will flow by gravity to the tanks or worms. The tanks are frequently of wood, lined with 6-pound lead, containing coils of 1-inch lead pipe, provided at the inlet end with a Buchner or silica funnel extending down into the end of the coil below the surface of the water. In this way the hot acid is not delivered to the lead pipe before the pipe is cooled on the other side by water, thus reducing the wear and tear on the lead coolers. The cooling tanks may be built in a group with lead partitions. The various turns of the lead coil are separated by flat iron spreaders which are suitably bolted together in order to make the coil a rigid unit.

In other types of coolers, where water is abundant, the lead-lined tanks are filled with the acid and the cooling water is circulated through lead coils. The coils are built in sections, each section being independently supplied with cold water. The lower coils are kept cooler than the upper and the cold acid collected at the bottom of the tank is drawn off by an insulated siphon to the storage tanks.

Various designs of coolers are in use, according to the conditions at the different plants, but the general principles are the same.

At the plant of the Tennessee Copper Co., where there are about 3,600 tons of acid per day to be cooled from 150° to 35° C., there are nine coolers, rectangular in shape, the inside dimensions being 17 feet long by 8 feet 6 inches wide by 4 feet 8 inches deep. The framework is of steel channels placed edgewise to the cooler, supporting a shell of 15-pound lead, which is lined with 9 inches of acid-proof brick laid in acid-proof cement. Each cooler contains 71 coils of 1½-inch lead pipe, the coils being 12 inches in diameter. In the nine coolers there are more than 6 miles of 1½-inch lead pipe. The coolers are placed in two terraces so that the acid may flow from one series of cooler to the other.

At the modern plant of the Calumet & Arizona Mining Co., the cooling tanks are built with steel frames, and are lined with 6-pound lead sheeting, which is also lined with 4 inches of duro brick laid in duro cement. The tanks are 16 inches by 99 feet by 5 feet and each tank contains 5,000 feet of lead pipe, 1½ inches in diameter with ¼-inch walls. Instead of being built in large coils, the lead pipe is in small coils 15 inches in diameter. Each coil is independent of the other. These coils are placed in tanks with the central axis in a vertical position. (See Plate X, *B*, p. 116.)

In general, cooling of the acid is required only for the Glover tower. However, at plants where the Gay-Lussac tower acid is to be recirculated, or one portion of it is used in an intermediate tower, frequently this acid is also cooled.

ACID CIRCULATING SYSTEM.

The amount of acid that must be circulated around a chamber-plant system is very large. The amount of acid used over the Gay-Lussac tower will vary between 100 and 300 per cent of the acid produced in the chambers. This acid must be pumped to the top of each of the Gay-Lussac towers, where there are more than one, and also pumped to the top of the Glover tower. In addition, part or all of the chamber acid is pumped to the top of the Glover tower, and when intermediate-reaction towers are used, there is also more or less pumping in connection with these.

For pumping and circulating these quantities of acid, various devices have been employed, chief among them being the compressed-air lift in connection with an acid "egg" or "blow case." The "eggs" are usually cast-iron cylinders of different sizes having rounded ends and supplied with three pipe openings. The "egg" is filled with acid through one pipe containing a check valve, which prevents return of the acid when the pressure is applied. Compressed air is admitted through another pipe. A third pipe, extending to the bottom of the egg, permits the acid to leave the vessel under pressure, followed by a volume of air equal to or slightly greater than the compressed volume.

The Kestner automatic elevator (fig. 13) manufactured by the Bethlehem Foundry & Machine Co. has been used for years at many of the largest acid plants with satisfactory results. Acid runs from tank *a* through the valve *e* to the pulsometer *b*. When this is filled, the acid lifts up the float *f*, whereby the rod *c* opens the inlet valve in the air distributor *d* and shuts the outlet valve, so that the air forces the acid upward in pipe *h*. Part of the compressed air at last enters *h*, thereby lowering the pressure in *b* and the float *f* descends and opens the air outlet, the air inlet being shut.

Pulsometers built on the plan of the Pohle air-lift for wells are favored by some concerns where the necessary depth of well can be obtained readily. These lifts supply a

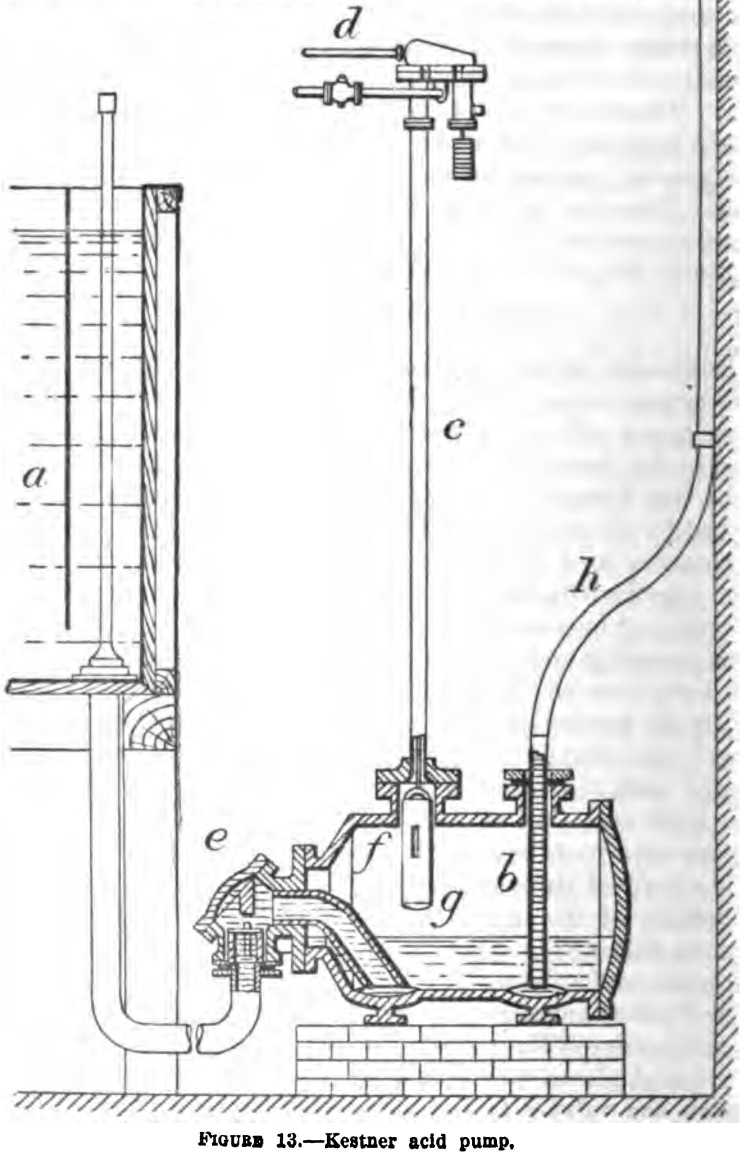
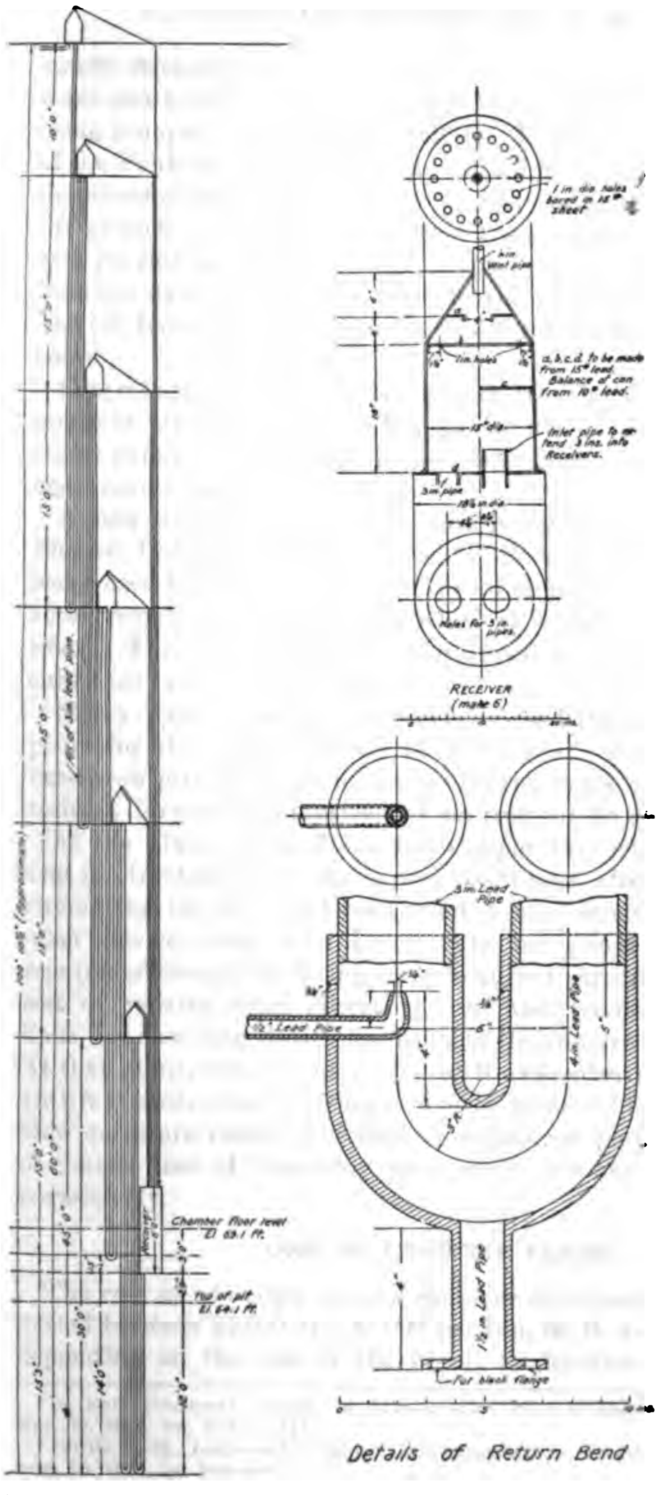


FIGURE 13.—Kestner acid pump.



POHLE MULTIPLE-STAGE AIR LIFT.

steady stream like a pump, have no moving parts, and thus can be made practically free from wear. The control of the amount of acid being pumped is reasonably accurate. Plate XI shows an adaptation of the Pohle air lift.[a] The acid is lifted in stages through lead pipes, the distance between successive receivers being 15 feet, and the total lift in each column being 45 feet. The compressed air is introduced by a jet just above the bend of the pipes, the acid flowing by gravity from the receiver and being lifted by the air to the next receiver above. The lift has a pumping capacity of 300 tons to 500 tons of acid per 24 hours.

Centrifugal pumps of special cast iron have been utilized with excellent success for low lifts, among these being antimonial-lead closed-runner centrifugal pumps, lead-lined closed-runner centrifugal pumps, and duriron pumps.

A new acid-proof pump is now being manufactured by G. H. Elmore, Colonial Trust Building, Philadelphia, Pa. The materials being used in the pump are acid-proof stoneware and "bario metal," an extremely hard alloy, upon which it is claimed the acids have no effect. The pump is of the open-impeller, side-suction type, made either for belt or motor drive.

Heavy-walled lead pipe is generally used throughout the chamber plant for the transportation of weak acid. In some plants lead-lined iron pipe has been used, also special types of iron, such as corrosiron, duriron, and tantiron. Cast iron can be used for 60° B. acid.

At the plant of the Tennessee Copper Co., where the amount of acid in circulation per day is over 3,600 tons, after various means of circulating the acid had been tried it was concluded that although other devices may have lower costs for power consumed yet as regards efficiency, operating labor required per unit of acid pumped, cost of repairs, total operating cost, and freedom from interruptions, no elevating device has equaled the compressed-air blow case.[b] At that plant, with the exception of the chamber acid, for which the air lift is used, all acid lifting is done by means of blow cases. All the blow cases are made of riveted wrought-iron plates. The feed and discharge lines of these blow cases are 6-inch and 4-inch iron pipes, respectively.

COST OF CHAMBER PLANT.

The cost of construction of a chamber acid-plant prior to the war varied between $2,000 and $3,000 per ton, 60 B. acid, daily capacity, depending on the size of the plant, its location, and the general local conditions for building. During 1917 and 1918, the cost increased to about $4,000 per ton capacity, not including the roasting and burner equipment. Thus a plant of about 100 tons capacity, 60° B. basis, is estimated to cost at the present time about $500,000, including the roasters or sulphur burners, bins, and storage tanks, etc. The same plant in 1914 would have cost about $300,000.

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[a] De Kalb, Courtenay, Calumet & Arizona sulphuric acid plant: Min. and Sci. Press, Mar. 30, 1918, vol. 116, p. 444.

[b] Fairlie, A. M., Large-scale sulphuric acid manufacture: Chem. and Met. Eng., vol. 19, Sept. 25, 1918, pp. 404–406.

COST OF MANUFACTURE OF CHAMBER ACID.

The cost of manufacturing sulphuric acid by the chamber process, of course, varies greatly according to the cost of raw materials—pyrite, sulphur, or waste gases, and sodium nitrate—the efficiency and skill of operation, and to a considerable extent the design and the construction of the plant, as it may be or not be well designed for the most economical operation.

At one large well-designed plant, exclusive of plant amortization charges, or cost of sulphur-bearing material, but including cost of roasting, and all charges for operation and repairs, labor and materials, the cost of producing 50° B. acid under 1914 conditions was not more than $2 per ton. With sulphur-bearing material at 15 cents per unit of sulphur, the total cost, exclusive of amortization charges, would be about $5 to $5.25 per ton of acid (50° B. basis).

The cost of concentrating chamber acid to 60° B. strength was very small, as the plant was well designed, having ample Glover tower capacity and sufficient heat in the gases for the purpose, and thus the cost of producing 60° B. acid was about $2.60. With sulphur at 15 cents per unit, this makes a total cost of about $6.75 per ton of 60° B. acid.

During the latter part of 1918, when the cost of sulphur was more nearly 30 cents per unit at acid plants and the price of labor and supplies had gone up considerably, the cost of manufacturing chamber acid (60° B. basis) at the above plant had increased to about $13.50 per ton, of which $8.30 was for sulphur and $5.20 was for sodium nitrate, operating labor, repairs, and supplies and general plant overhead, but not including amortization and depreciation.

The cost of raw material (sulphur gases) at plants making acid as a by-product from roasting zinc ores is much smaller than at plants operating on pyrite or sulphur, being in some instances practically nothing, but the operating cost is usually higher, as the gas concentrations are more variable, resulting in loss of nitrate of soda and greater wear and tear on the chambers. By-product acid from zinc ore has been made for less than $4 per ton (60° B. basis) under pre-war conditions.

At a large acid plant in the west where concentrates are being roasted for the sulphur at the acid plant and then returned to the smelter for smelting, the cost of producing 60°B. acid in 1916 was between $2.50 and $3 per ton, of which about $1 was the cost of roasting. By 1918 the cost had been raised to over $5 per ton.

At the present time a plant producing 60° B. acid for $4 per ton from pyrite, exclusive of the cost of pyrite or of plant amortization and depreciation, is doing very good work. With brimstone the manufacturing cost is somewhat less, and a $3 cost is quite possible.

Thus, with pyrite at 15 cents per unit or brimstone at 18 or 19 cents per unit, the cost of manufacturing acid (60°B. basis) at a plant of at least 100 tons per day capacity will be about $8 to $9 per ton. The following example shows the estimated cost of manufacturing acid (60° B. basis) at a 100-ton plant, with brimstone at 18 cents per unit and nitrate of soda at $4 per 100 pounds.

Cost per ton of acid.

28 units of S at $0.18	$5.05
Nitrate of soda, 3.6 per cent, equals 20 pounds	.80
Operating, labor, and power	.80
Repairs and supplies	.70
Overhead supervision, insurance, etc	.65
	8.00

PRODUCTION OF SULPHURIC ACID FROM WASTE GASES AT COPPER BLAST FURNACES.

The production of sulphuric acid from waste gases at copper blast furnaces, as practiced at the plants of the Tennessee Copper Co. and the Ducktown Copper, Sulphur & Iron Co., presents so many unusual features as compared with the ordinary methods of manufacture that a brief outline of the practice at these two smelters may well be given here.

Sulphuric acid may be manufactured from the waste gases from blast furnaces only where pyritic or nearly pyritic smelting is practiced. Without describing in detail the practice of pyrite smelting, it may be stated that this method of smelting involves the utilization as completely as practicable, as fuel for the smelting process, of the sulphur and iron contained in the ore. In true pyritic smelting no carbonaceous fuel is used. However, the term has been used to cover those cases where the percentage of coke used in the charge is less than 6 per cent, this coke being added either because the sulphur and iron content of the charge is insufficient to provide heat for the smelting process, or because it is impossible to utilize all the sulphur and iron efficiently. The use of coke in smelting, of course, causes the presence of carbon dioxide in the exit gases, and the amount of carbon or coke that may be used in the charge if sulphuric acid is to be made from the gases is limited by the relative amounts of sulphur dioxide and carbon dioxide which will be made. Too high a coke content, such as 6 per cent or more, will produce a gas so high in carbon dioxide that the sulphur dioxide content will be too low for acid manufacture, especially when the sulphur dioxide concentration is still further diluted by air to give the necessary oxygen for carrying on the process.

The factors concerning the proper proportions of carbon, sulphur, and iron for proper metallurgical results, and the effect of variations in these constituents, or in the composition of the gases, are discussed in detail in an article by Falding and Channing.[a]

If only sufficient air is blown into the furnace to provide oxygen for oxidizing the sulphur, iron, and other oxidizable constituents of the charge and no coke is used, then the exit gases will consist of sulphur dioxide and nitrogen, or, if coke is used, the gases will carry carbon dioxide with the sulphur dioxide and nitrogen. As the best metallurgical results are obtained when very little or no excess air is blown into the furnace through the tuyères, there being an exact equilibrium between the oxygen supplied through the tuyères and the oxidizable content of the charge, the exit gases under perfect metallurgical operation will contain no free oxygen.

For many reasons it is technically impossible to maintain this equilibrium; consequently the composition of the gases issuing from the furnace is irregular and fluctuates greatly. Some of the conditions tending to upset this balance are enumerated as follows:

(1) There are always unavoidable fluctuations in the charge, even when the ores are bedded and carefully mixed. (2) Irregularities in weighing are apt to exist. (3) The charging of the furnace is intermittent, with the result that for a period immediately after the charge has been dropped there is present in the furnace more sulphur, iron, and coke than is present just before charging. With an excess of oxidizable material present some sulphur may volatilize, and carbon monoxide form. (4) Occasionally blowholes form and permit air to escape from the furnace without acting on the iron, sulphur, or coke, resulting in the presence of free oxygen in the exit gases. When the metallurgical functions of the furnace are at their best, as when the smelting is going on smoothly, charges are being carefully prepared and weighed and are being fed regularly, no blowholes or furnace crusts are present, and the gases are rising

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[a] Falding, F. J., and Channing, J. P., Pyrite smelting and sulphuric acid manufacturer: Eng. and Min. Jour., Sept. 17, 1910, vol. 90, pp. 555–558.

evenly through the furnace charge. Then there is practically no free oxygen and no carbon monoxide present in the gases.

When several furnaces are in operation, discharging into a common flue, it is much easier to maintain a gas production of suitable concentration and uniformity for making acid than with only one furnace in operation.

A general misapprehension relative to the production of sulphuric acid from blast-furnace gases is that the sulphur costs nothing. This is hardly true. The operation of a blast furnace, or blast furnaces, in connection with an acid plant involves certain items of expense which would not be incurred if control of the composition of the gases as they pass into the flues were unnecessary. Of course, the extra care demanded in the management of the furnaces is, to a large extent, repaid by the better metallurgical results obtained with the furnace. However, the cost of manufacturing acid from smelter gases is higher than from gases derived from burning pyrite or brimstone. On account of the fluctuating composition of the gases, when using blast-furnace gases, it is almost impossible to realize as high an efficiency of the niter. By careful supervision and frequent and regular analyses of the gases, it has been found possible to reduce the niter consumption to a figure much lower than was obtained when plants were first operated on blast-furnace gases, but even under this careful technical supervision the niter consumption is between 6 and 8 per cent as against 3 or 4 per cent in most commercial burner plants. Furthermore, in order to obtain this result it is necessary to provide unusually large Gay-Lussac tower capacity. In the usual burner plant a Gay-Lussac tower capacity, equal to 2 or 3 per cent of the chamber capacity, is adequate for recovering 85 to 90 per cent of the niter, but in plants using blast-furnace gases it is necessary to provide at least 6 per cent. The presence of such a large percentage of CO_2 in the gases also increases the chamber space necessary for the conversion of a definite weight of sulphur dioxide, above that required in a commercial plant, and thus the interest, depreciation, and maintenance charges per ton of acid produced are greater.

PLANTS AT COPPERHILL AND ISABELLA, TENN.

The ores treated at the plants of the Tennessee Copper Co. and the Ducktown Copper, Sulphur & Iron Co. at Copperhill and Isabella, Tenn., consist essentially of pyrrhotite with only a small proportion of pyrite. The copper mineral present is chalcopyrite. The ores also carry about 4 per cent zinc blende. The gangue material consists of silicates, calcite, dolomite, and some magnetite.

A typical ore at the plant of the Ducktown Copper, Sulphur & Iron Co. would analyze as follows:[a]

Mineral analysis.

	Per cent.
Pyrrhotite	29.50
Pyrite	5.82
Chalcopyrite	7.89
Blende	4.23
Magnetite	7.73
Quartz	15.59
Silicates	22.74
Calcite	2.16
Dolomite	3.56

Qualitative analysis.

Copper (Cu)	2.74
Iron (Fe)	30.37
Sulphur (S)	18.87
Silica (SiO_2)	26.96
Lime (CaO)	1.67
Magnesia (MgO)	2.97
Manganese (Mn)	2.80
Alumina (Al_2O_3)	2.91

The ores smelted by the Tennessee Copper Co. in 1917 analyzed about as follows:

Composition of ore smelted by Tennessee Copper Co.

	Per cent.
Copper (Cu)	1.5 to 2.5
Sulphur (S)	19.0 to 30.0
Iron (Fe)	23.0 to 38.0
Silica (SiO_2)	14.0 to 30.0
Calcium (Ca)	4.0 to 5.5
Magnesia (MgO)	1.2 to 2.4
Alumina (Al_2O_3)	3.5 to 4.6

Of the two plants that of the Tennessee Copper Co. is the larger. At this plant the ore is smelted in furnaces measuring 258 inches by 56 inches at the tuyère level, each handling about 400 tons daily, with a coke consumption ranging between 4 and 6 per cent. There are four of these furnaces installed, but not more than three are operated at one time.

About 85 to 87 per cent of the total sulphur in the charge is oxidized to sulphur dioxide, the rest going into the matte. On account of gas leakage from the furnace tops and of other losses, the proportion of sulphur actually utilized in the acid is only about 65 to 70 per cent of the total, or between 75 and 80 per cent of the sulphur oxidized. The gases issuing from the top of the charge, under good conditions of furnace operation, average about 8 to 9 per cent SO_2,

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[a] Larison, E. L., Sulphuric acid from copper smelting gases: Eng. and Min. Jour., vol. 102, Dec. 30, 1916, pp. 1121–1125.

6 to 7 per cent CO_2, and less than 1 per cent CO, the difference being nitrogen. As these gases contain no oxygen, it is necessary to admit air enough to carry on the acid-making process and to provide some oxygen in the exit gases. This necessary air is admitted at several points in the system by a low-pressure blast. If the tops of the furnace were operated under suction, of course there would be plenty of oxygen drawn in; but as suction affords little control of air admission, it is best to make the furnace top as nearly air-tight as possible to maintain as nearly neutral a draft condition as possible in the furnace above the charge and to provide the necessary air by a positive blower. However, it is a difficult matter to adjust the draft at the furnace tops to maintain nearly neutral conditions, and there is usually some leakage of "false air" into the flues, or a back pressure, making working conditions on the charging floor of the furnace rather disagreeable. Air is blown in at the flue between the furnace and the Glover towers, and each chamber is fitted with air lines and valves for regulating the admission of air, so that an oxygen content of between 3 and 4 per cent is maintained throughout the system.

In the first installation at Copperhill the chambers were built along the lines of Falding's theories, some of the chambers being 77 feet high. In all there were 34 chambers, having a total capacity of about 4,000,000 cubic feet. Subsequently a second plant with four huge chambers, having a total chamber space of 2,228,000 cubic feet, was erected, making the total chamber space for the plant more than 6,000,000 cubic feet. During the war the plant produced as much as 1,000 tons of acid (50° B. basis) per day. The original installation has been described in detail by Stevens[a] and Nelson[b] and the recent improvements by Fairlie.[c]

The plant of the Ducktown Copper, Sulphur & Iron Co.[d] was built more along conventional lines. There were 16 chambers, each 24 by 96 feet by 3 feet high, connected eight to a set, with special flue connections designed to mix thoroughly and cool the gases and to prevent segregation of carbon dioxide.

This plant has been operated from one blast furnace for long periods. A novel temperature-controlling device in use in connection with the dust-cleaning system seems to overcome some of the difficulties incident to operating a plant from a single blast furnace.

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[a] Stevens, H. J., Copper hand book, Tennessee Copper Co., Tenn.: vol. 10, 1910–11, pp. 1661–1667.

[b] Nelson, W. A., Manufacture of sulphuric acid in Tennessee for 1911: Resources of Tennessee, Tennessee Geol. Survey, vol. 2, 1912, pp. 23–24.

[c] Fairlie, A. M., Large-scale sulphuric acid manufacture, Chem. and Met. Eng., vol. 19, Sept. 25, 1918, p. 404.

[d] For detailed description of this plant, see "Smeltery smokes as a source of sulphuric acid." by W. H. Freeland and C. W. Renwick, Eng. and Min. Jour., vol. 89, May 28, 1910, pp. 1116–1120.

One of the adverse factors in the manufacture of acid at these plants is the presence of zinc oxide and sulphates in a very finely divided impalpable fume carried along by the gases. This fume does not settle out readily in the dust chambers, but is carried over into the Glover towers and into the acid chambers, tending to clog the gas passages and flues, contaminate the acid, and clog the circulating pumps. In order to remove as much of the zinc fume as possible, special dust-collecting devices, or chambers, containing baffles or channel irons to aid precipitation by offering contact surfaces, have been installed. Metallic zinc is now being recovered from the fume. In spite of these devices, however, some zinc fume goes through into the chambers, and the "front-chamber" acid produced by these plants at times is "dirty" or "sludgy." A large proportion of the product has satisfactory clearness and purity.

PURIFICATION OF CHAMBER ACID.

With the exception of lead sulphate, nearly all the impurities of chamber acid are brought into the system by the burner gases, and the character and amount of such impurities depend largely upon the kind of raw material being used.

The impurities consist of various oxides of arsenic, antimony, selenium, lead, iron, zinc, copper, lime, aluminum, fluorine, together with nitrous and nitric acid, nitric oxide, and organic matter.

Most of the impurities not collected in the dust chambers are mechanically deposited as sediment in the Glover towers, or in the first chamber. Even when the "first-chamber" acid is dirty it is usually possible to obtain from the back chambers a sufficiently pure acid for most manufacturing purposes. At most phosphate fertilizer plants, the presence of impurities in the proportions usually found is not important and no attempt is made to purify the acid.

The nitrous compounds are removed by heating the acid with 0.1 to 0.5 per cent of powdered ammonium sulphate present.

Most acid plants making acid for precise manufacturing purposes exercise great care in the selection of pyrite and have effective dust-collecting systems, or use brimstone, so that the amount of impurities getting into the acid is very small.

However, at some plants where there is a decided advantage, as regards costs of production, in using waste gases from desulphurizing impure sulphides, especially zinc blende and arsenical copper sulphates, it is desirable to purify part or all of the output of acid.

When the impurities are solid particles held in suspension, it is usually possible to clarify the acid by allowing it to stand in settling chambers and then siphon or pump the clear acid from above the settled material. Some impurities remain in solution and require chemical treatment. The most troublesome of all are arsenic and selenium. The latter can be precipitated by the addition of a small quantity of potassium chloride. Arsenic is present usually in much larger quantities, the content varying up to even 0.5 per cent, and unless practically eliminated will contaminate all products manufactured from the acid. Thus, with the stringent requirements of the pure food and drug act, the dearsenication of sulphuric acid is important. Arsenic is removed by the use of hydrogen sulphide (H_2S). Three types of apparatus are used for the purpose, as follows:

1. The old type of tower in which the H_2S gas ascends a lead-lined tower, specially packed, and meets a downward stream of weak chamber acid. This method is costly, wasteful of H_2S, and requires considerable dilution of the acid.

2. The intermittent method, using closed vessels and blowing H_2S gas into the vessel under pressure. This method permits precipitation of the arsenic from acid of fairly high strength and therefore saves subsequent concentration. It requires a considerable excess of H_2S.

3. The modern "Trepex" machine is continuous in operation, the raw acid being agitated by revolving propellers or paddles and coming into intimate contact with the H_2S gas. The agitation also prevents settling of the arsenic sulphide. A "Trepex" machine consists of an iron drum, which is divided into sections. The drum is lined with a special enamel that is very resistent to acid up to 200° C. Vents in each section are so placed that the sulphuric acid runs from one section to another until it reaches the outlet pipe, thence it goes to a settler or to a filter tank, where the arsenic sulphide is completely filtered out. The filter tanks usually have false bottoms with a grid composed of heavy plank and covered with lead or acid-proof brick, having communicating gutters underneath. The grid is covered with pieces of quartz and then with finer material. The upper layers are ordinary sand over which a perforated lead sheet is placed to prevent disturbing the arsenic sulphide when the filter is cleaned. The filtering layer thus formed is finally covered with a layer of dry arsenic sulphide. For light arsenical ores the porous type of filter is in considerable use. This filter is composed of porous tiles, jointed by suitable mortar (such as silicate of soda and water thickened with "lava" or "volvic" stone).

The excess of hydrogen sulphide from the machine is either absorbed by caustic soda solution or milk of lime. The hydrogen sulphide is generated by treating ferrous sulphide with warm dilute acid (20 to 40 per cent H_2SO_4) in a suitable generator constructed similar to an ordinary Kipp generator.

The dearsenicators range in size from 20 to 500 ton capacity weekly. The advantages of the Trepex machine over the other forms of dearsenicators are (1) small initial expense and small operating cost, (2) effective use of H_2S and practically complete elimination of arsenic compounds, and (3) large continuous output at low cost.

The Trepex machine was developed by the Davis Bros., Manchester, England, and was introduced into this country by the Industrial Research Corporation, New York City.

For the precipitation of arsenic in the Trepex machine, the acid must be diluted to about 65 per cent or 53° B. The purified acid can not be reconcentrated by evaporation in the Glover towers, as it would be again contaminated by the impurities in that tower. Thus, whenever acid is to be purified the usual procedure is to take the acid directly from the chambers, and then after purification to concentrate the acid in special types of concentrators.

As this operation is of minor importance, or not practiced at all at most plants in this country, further discussion will not be given here. An excellent description of the management and control of a plant for the dearsenication of sulphuric acid is given by Cory.[a]

One method of removing arsenic from acid is by precipitation with barium sulphide. This method, however, is rarely used. Its advantages are that (1) the barium is itself precipitated as sulphate and thus adds greatly to the weight and density of the precipitate, and (2) all other soluble material is precipitated. To precipitate with barium sulphide, however, the acid must be diluted to 50 per cent strength, and then heated to 80° C.

With the removal of the arsenic by either the H_2S or BaS precipitant, practically all other impurities except iron and aluminum are removed at the same time and the acid is even clarified from inert suspended matter.

At new chamber plants, uncontaminated by impurities from pyrite, etc., it is possible to make clear acid by the use of brimstone; but to produce a thoroughly pure clear white acid from impure pyrite or other impure materials it is necessary to use a distillation method of purification or to make acid by the contact process.

CONCENTRATION OF CHAMBER ACID TO 60° B. STRENGTH.

Attention has already been called to the fact that with the proper use of the Glover tower the whole output of chamber acids can be concentrated from 50° B. to 60° or 62° B. The chief advantages of this system over any other method of concentration are that (1) the heat of the combustion of the pyrite or brimstone is utilized for the purpose rather than expensive fuel, (2) the steam thereby produced is returned to the system where needed in the lead chambers, and (3) all weak acid distillates are returned to the system without loss or additional cost for concentration.

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[a] Cory, H. E. J., Dearsenication of sulphuric acid. Scientific management and control: Chem. Trade Jour. and Chem. Engineer, vol. 62, Feb. 2, 1918, pp. 89–90.

The only drawback to this method is the impurity of the acid when produced at plants burning pyrite or other metallic sulphides.

For concentrating chamber acid directly to 60° B., or for reconcentrating purified acid to 60° B., evaporation has been effected in leaden pan evaporators, heated either by a direct fire, by steam, or by waste heat from the pyrite burners. In some installations the hot gases passed directly over the pans and in others the pans were heated from the bottom. The first method produces the most rapid rate of evaporation, but is not employed when clear acid is desired, as the hot gases are apt to leave dust or soot on the surface of the acid. Various forms of lead-pan evaporators, with various methods of firing, have been used in the past for the concentration of acid to 60° B., but as the method is seldom used in this country now and the tonnage of acid concentrated in this way is comparatively small, further discussion will not be given here. Details of lead-pan evaporation of acid to 60° B. are given by Lunge.[a]

CONCENTRATION OF SULPHURIC ACID TO 66° B. STRENGTH BY HEAT.

Although commercial "oil of vitriol" (66° B. acid) can now be made more cheaply by the contact process than by the heat concentration of chamber acid or of 60° B. acid, yet in certain plants in this country this higher-strength acid is being made by the concentration of the weaker acids. During the war, when the demand for higher-strength acid was great and the price was high, concentrators were put in and utilized at various plants. With the end of the war, many of these concentrating plants have been shut down. However, as a certain amount of 66° B. acid is now being produced and for various reasons will continue to be produced by the heat concentration of chamber acid, a description of the more modern concentrators is desirable. These concentrators are used also for concentrating waste acids or spent acids from the manufacture of explosives, dyes, and various other products in the manufacture of which sulphuric acid is used as a dehydrating agent. A small amount of acid has been concentrated to 98 per cent strength by heat concentration, but if strengths higher than 95 per cent are required it is much more economical to bring up the strength of 66° B. acid (93.18 per cent H_2SO_4) by adding fuming acid or oleum.

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[a] Lunge, George, Sulphuric acid and alkali, vol. 1, pt. 3, 1913, pp. 1079–1193.

Sulphuric acid can be concentrated by evaporation up to 98.3 per cent H_2SO_4, at which concentration it possesses its highest boiling point, 338° C., and can be distilled without decomposition. Acid of higher strength than this decomposes under heat and gives SO_2, H_2O, and O.

CONCENTRATION IN STILLS.

Formerly considerable acid was concentrated in stills heated externally by waste gases or by coal fire. These stills were made of glass, porcelain, or platinum, and finally of special cast iron. Glass and porcelain stills were early discarded because of the heavy breakage involved. Large quantities of acid have been evaporated in former years in platinum stills, but as the cost of platinum became greater and greater, the cost of these stills became prohibitive. Furthermore, the hydrogen, carbon, sulphur, and silica present in the heating gases cause deterioration of the platinum, and various impurities in the acid also cause slight chemical reactions, so that the cost of maintenance became increasingly greater as the cost of platinum rose.

Cast-iron stills have been used successively for the higher concentration of acid, that is, from 66° B. (93.18 per cent) even to 98 per cent. Below 66° B. the action of acid on ordinary cast iron is very severe and the life of a still was usually less than three or four months. Special grades of cast iron high in silicon are now made—namely, corrosiron, duriron, and tantiron—which have a greater resistance to such strength of acid, and pans of these special irons are now successfully employed as concentrating stills.

In one modern installation the stills were of duriron, were kettle-shaped, about 4 feet in diameter and 2 feet deep, with flat tops to allow setting them in the brick walls so as to be almost entirely surrounded by fire space. Tops were provided for these stills to lead the vapors to a condenser of lead.

Cast-iron stills are built in various shapes.[a] In some types provision is made for cascading the acid through several shallow stills, each being provided with partitions to force the acid to travel in zigzag manner and thereby expose it to the heat more efficiently.

The greatest cause for deterioration of the still is by the formation of a "scale" or deposit of ferric sulphate on the bottom. This scale not only decreases the efficiency of the still, but causes local overheating of the iron beneath the "scale" and subsequent burning or cracking. Thus, provision must be made for cleaning the stills either through a "mud drum" in the bottom or by access to the still from above.

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[a] Lunge, George, Sulphuric acid and alkali, vol. 1, 1913, pt. 3, pp. 1158–1179.

More fuel is required for the concentration of acid in cast iron than in platinum. As against a coal consumption of approximately 20 per cent in platinum stills, the consumption of coal in concentrating acid from 60 to 66° B. in cast-iron pans is about 30 per cent.

Kessler's still, described by Lunge[a] and by Rogers,[b] in which concentration was effected by the heat from a coke fire or producer gas, was tried in this country about 1900, but its use has not been general. From the Kessler still has been developed the modern tower concentrator which is described on subsequent pages (pp. 139).

With the advent of successful modern tower concentrators the use of the cast-iron stills has become less and less important.

CONTINUOUS CASCADE CONCENTRATORS.

The continuous cascade concentrator was originated in England, and at first consisted of four or five glass retorts arranged in cascade over a coal or a gas fired furnace. Porcelain dishes set in an acid-proof brick chamber were later substituted for glass retorts. One of the most serious drawbacks to this system, whether using glass or porcelain, was the heavy breakage of the pans and the difficulty of getting high fuel efficiency; hence the system was not generally adopted.

With the development of vitreosil (fused silica) in 1906, there was a more general adoption of the use of cascade systems, and several were installed in this country. The largest is at the plant of the Davison Chemical Co., at Baltimore, Md.

An elevation of a concentrating plant with the cascade system[c] is given in figure 14.

The upper pans are 24 inches by 12 inches, and the dishes are 12¼ inches in diameter. In a unit to produce 10 tons of 66° B. acid per 24 hours from 50° B. acid, there would be 60 preheating pans and 100 dishes, the pans arranged in six rows of ten pans each, and the dishes in four rows of 25 dishes each. All the pans and dishes, except the last three dishes in each row at the lower end of the system, are supported in open seats and are directly exposed to the fire gases. The last three dishes have closed seats in order to provide protection to the seating from the boiling and spurting of the acid in the dishes. Natural-draft furnaces burning soft coal are in general use, the fuel consumption being about 17 per cent, based on the weight of the finished product. Breakage of the dishes amounts to about 5 per cent, and of the pans to about 1 per cent per annum. Vitreosil

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[a] Lunge, George, Sulphuric acid and alkali, vol. 1, pt. 3, 1913, pp. 1142–1149.

[b] Rogers, Allen, and Aubert, A. B., Industrial chemistry, 2d edition, 1915, Chap. I, General process and materials, pp. 1–31.

[c] Marshall, A. E., Fused silica dishes for the concentration of sulphuric acid: Met. and Chem. Eng., vol. 13, Mar., 1915, pp. 136–137.

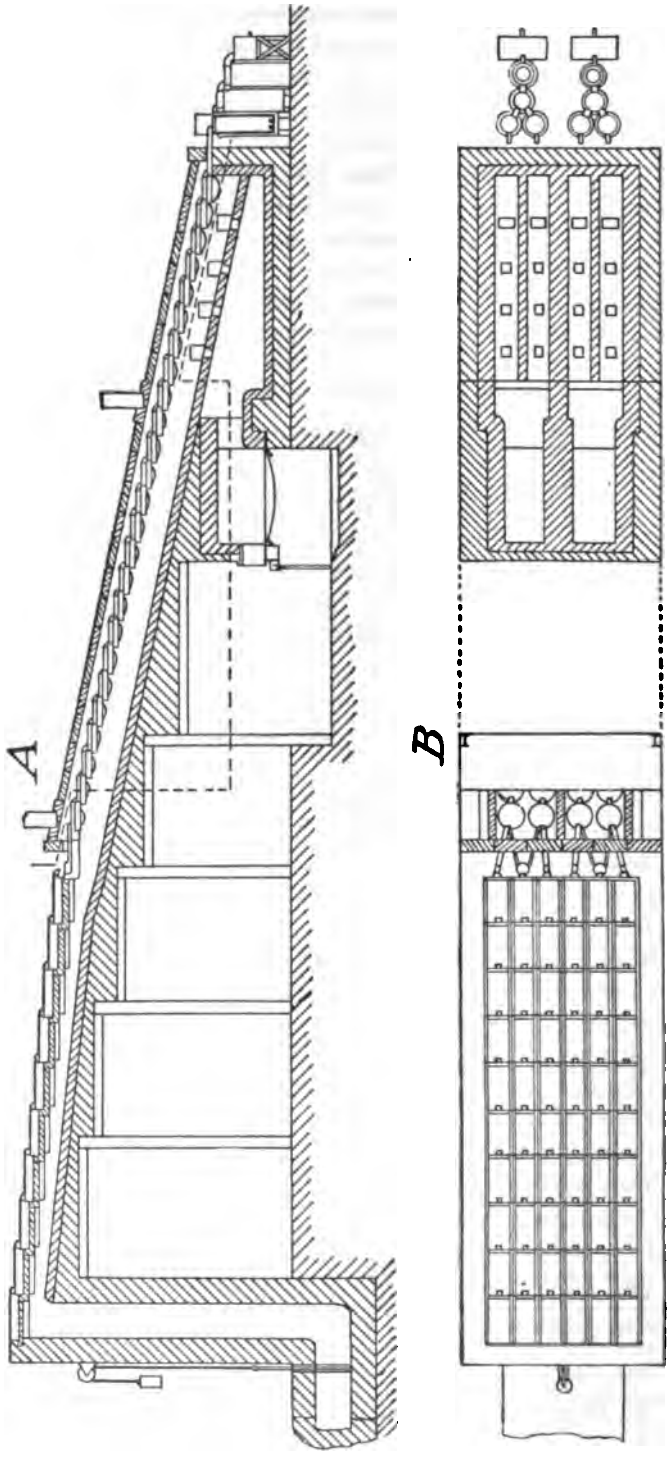


FIGURE 14.—Cascade system of concentration. A, elevation; B, plan.

has a very low coefficient of expansion, about one-sixth of that of porcelain. Thus vitreosil dishes do not break through temperature changes, no matter how severe. This resistance to temperature changes permits the vitreosil dishes to be directly exposed to the fire gases in open seatings, thus permitting higher fuel economy than when the dishes must be protected from the direct flame by slabs or other means.

With this type of concentrator the loss of acid fume or mist is relatively very high unless apparatus for the recovery of the fume are installed. Coke towers have usually been installed for the purpose until the advent of electrical precipitation. These are described later.

The cost of concentrating with this type of concentrator in a 10-ton unit is about as follows per ton of 66° B. acid from 60° B. acid:

Coal, 17 per cent, at $5 per ton	$0.85
Labor	1.25
General expense and repair	1.00
Losses, 4 per cent of acid, assuming 60° B. acid=$8 per ton	.30
Total, per ton of 66° B. acid	3.40

Cascade systems may be made having pans made of alloys of iron, such as duriron, tantiron, and corrosiron. These pans may be open and provided with lips for the acid to cascade from each basin to the lower one ahead and becoming more and more concentrated in each basin. These can be placed in a flue with acid brick setting and heated from below as in the operation of vitreosil pans.

CHEMICO CONCENTRATOR OF THE CHEMICAL CONSTRUCTION CO.

The principal apparatus of the chemico concentrator (see fig. 15), consists of a combustion chamber, a concentrating flue, concentrating tower, filter and scrubbing tower, all of which are constructed of acid-proof masonry, well braced with steel framing, and supported on concrete or brick foundations at a suitable height above the ground level. On top of the concrete foundations masonry-lined lead pans are used, on which are built the masonry walls. The concentrating tower is packed with checkered brick, quartz, or other suitable packing and the filter tower is packed with 3-inch special rings.

Fuel oil, natural gas, or producer gas is used to generate the hot gases for evaporation. These gases pass from the combustion chamber through the concentrating flue and then up through the concentrating tower, where they come in contact with the weak descending acid which is thus preheated and partly concentrated. From the top of this tower the gases are drawn at a temperature of about 220° F. and are led through a lead or stoneware flue to the top of the filter and scrubbing towers. An exhaust fan placed at the base of the scrubbing tower draws the gases through this tower and discharges them into the atmosphere.

In flowing through the concentrating flue the gases pass over a pool of acid which is violently agitated by forcing compressed air through it from perforations in a pipe running submerged in the acid and lengthwise of the flue. Thus a large area of acid is exposed to the direct action of the hot combustion gases.

In passing up through the concentrating tower the gases come into contact with a countercurrent of weak acid. The tower is packed to allow a large contact surface for the gas and the acid, and the first portion of the concentration takes place in this tower. The flow of weak acid to the concentrator from an overhead tank is regulated to suit the conditions and results desired. The acid flows from the distributing pan to air-sealed lutes, which are equally distributed over the tower top and distribute the acid uniformly over the upper surface of the packing.

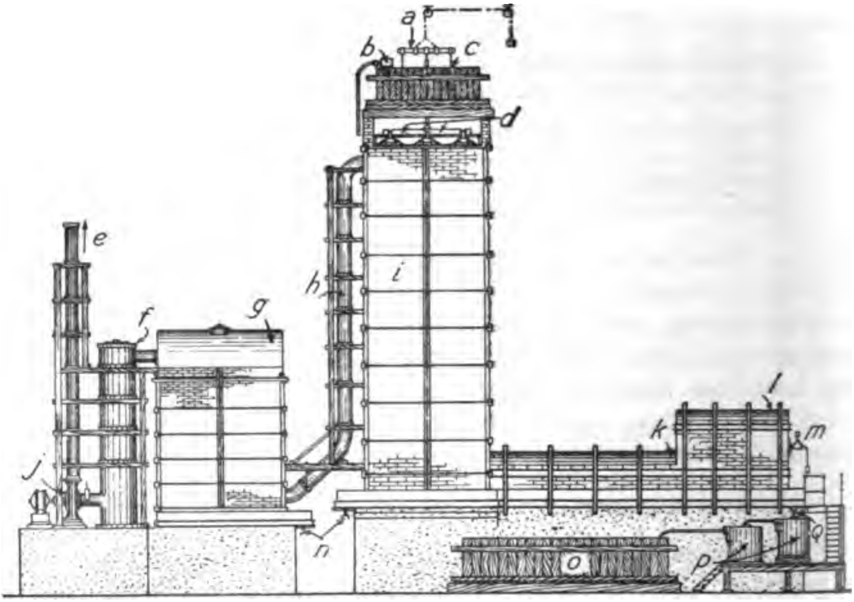


FIGURE 15.—Chemico concentrator, side elevation; *a*, Acid regulator; *b*, blow box; *c*, distributing tank; *d*, acid distributor; *e*, exit for steam and combustion gases; *f*, scrubbing tower; *g*, filter tower; *h*, gas flue; *i*, concentrating tower; *j*, exhaust fan: *k*, concentrating flue; *l*, burner; *m*, oil and gas burner; *n*, wash out and acid overflow; *o*, intermediate and storage tank; *p*, acid coolers; *q*, acid overflow.

In the filter and scrubbing towers the acid mist carried over by the waste gases from the concentrating tower is to a large extent recovered, though not entirely so. The loss may be 2 to 4 per cent of the total acid.

The hot concentrated acid from the concentrating flue is drawn off into lead coolers. All iron salts deposit in the flue and in no way interfere with the efficiency of the concentration, the iron salts being removed through suitable openings without shutting down the concentrator.

The chemico concentrator requires about 13 to 14 gallons of crude oil to concentrate 1 ton of 66° B. acid from 50° acid. As the gases are discharged at 200° F. or less and the radiation loss is relatively small, the heat is fairly well utilized. These concentrators have been built in sizes having capacities of 15 to 125 tons of 66° acid per 24 hours.

KALBPERRY CONCENTRATING TOWERS.

The original Kalbperry tower was first erected and put into operation about 1906 and has been in continuous service ever since. The towers are now built in various sizes and capacities by the Kalbperry Corporation of New York City. The standard tower is 5 feet square by 39 feet high over all, with an actual concentration height of about 25 feet. The standard tower has a capacity of 1 ton of acid per hour (60° to 66° B.). A typical arrangement is shown in figure 16.

Liquid or gaseous fuel is burned in the furnace, *1*, the gases of combustion passing through the flues *1a* and *2e*, into and up through the tower *2*, and to the scrubber *3*.

The acid to be concentrated is delivered to the supply tank *2a* and thence fed into the top of the tower by the automatic feeding apparatus *2b*, *2c*, whence it flows down over the packing in the tower against the rising hot gases, the concentrated acid flowing from the tower through the exit *5* and the coolers *6* and *7* into tank *9*.

The acid fumes driven off in the tower and air pass through the scrubbers *3*, thence through the suction fan *11*, and thence through the auxiliary scrubber *4*, before being exhausted to the atmosphere at *4c*.

A so-called "5-foot" tower has a capacity for producing, when concentrating sulphuric acid from 60° B. to 66° B., about 1 ton of 66° acid per hour.

The fuel consumption will be about 10.5 to 12 gallons of 19,000 B. t. u. fuel oil per ton of 66° acid, concentrating from 60° B. to 66° B. In addition to the concentrated acid produced, about 10 per cent of the sulphuric acid charged is recovered as weak or scrubber acid of a strength of about 40° to 46° B., and there is a loss to the atmosphere of about 2 per cent.

One man can easily handle a battery of four towers.

Towers may be built of as large a capacity as is commercially desirable—they have been built with a minimum capacity of less than 2 tons per day—and concentration may be made from chamber strength up to 96.5 or 97 per cent, the limit of concentration attainable for sulphuric acid.

SKOGLAND CONCENTRATOR.

The Skogland concentrator is built by the Pratt Engineering Co., of Atlanta and New York. The greater part of the evaporation in this concentrator is brought about by the spraying of the acid in a chamber through which the hot combustion gases are passing. The fuel consumption of the Skogland concentrator averages around 12 gallons of oil per ton of 66° B. acid concentrated from 50° B. acid.

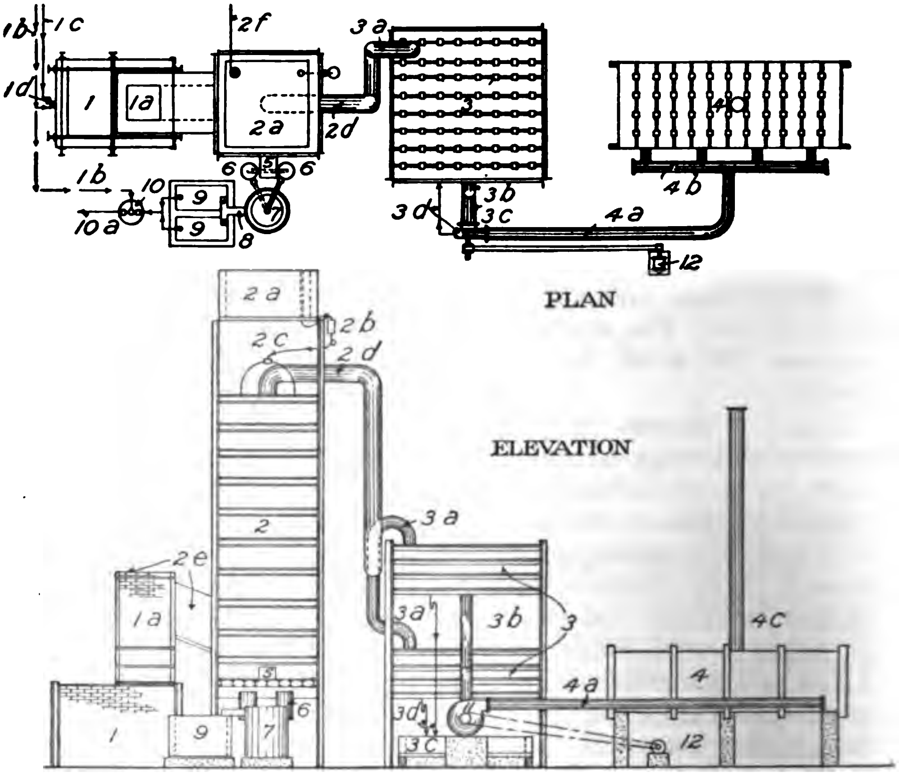
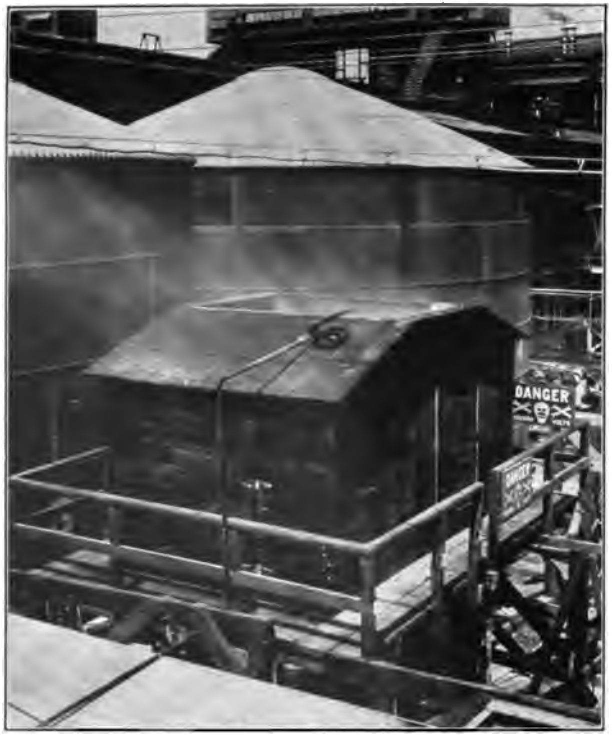


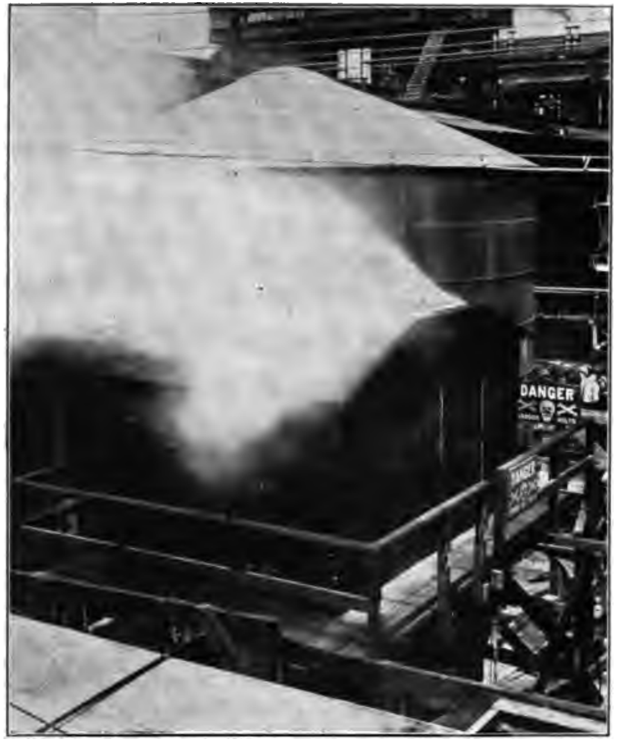
FIGURE 16.—Kalbperry concentrator. *1, 1a, 2c,* Furnace and flue; *1b, 1c, 1d,* air and oil piping; *2,* concentrating tower; *2a, 2b, 2c, 2f,* acid supply tank, siphon, and tower feed; *2d,* outlet gases from tower; *3, 3a, 3b, 3c,* scrubber and gas flues; *3d, 3c,* scrubber acid piping and tank; *4, 4a, 4b, 4c, 4d,* auxiliary scrubber and piping; *5,* outlet for concentrated acid; *6, 7,* acid coolers; *8, 9,* concentrated-acid tank; *10, 10a,* montejus; *11,* fan; *12,* motor.

ELECTRICAL CONCENTRATOR.

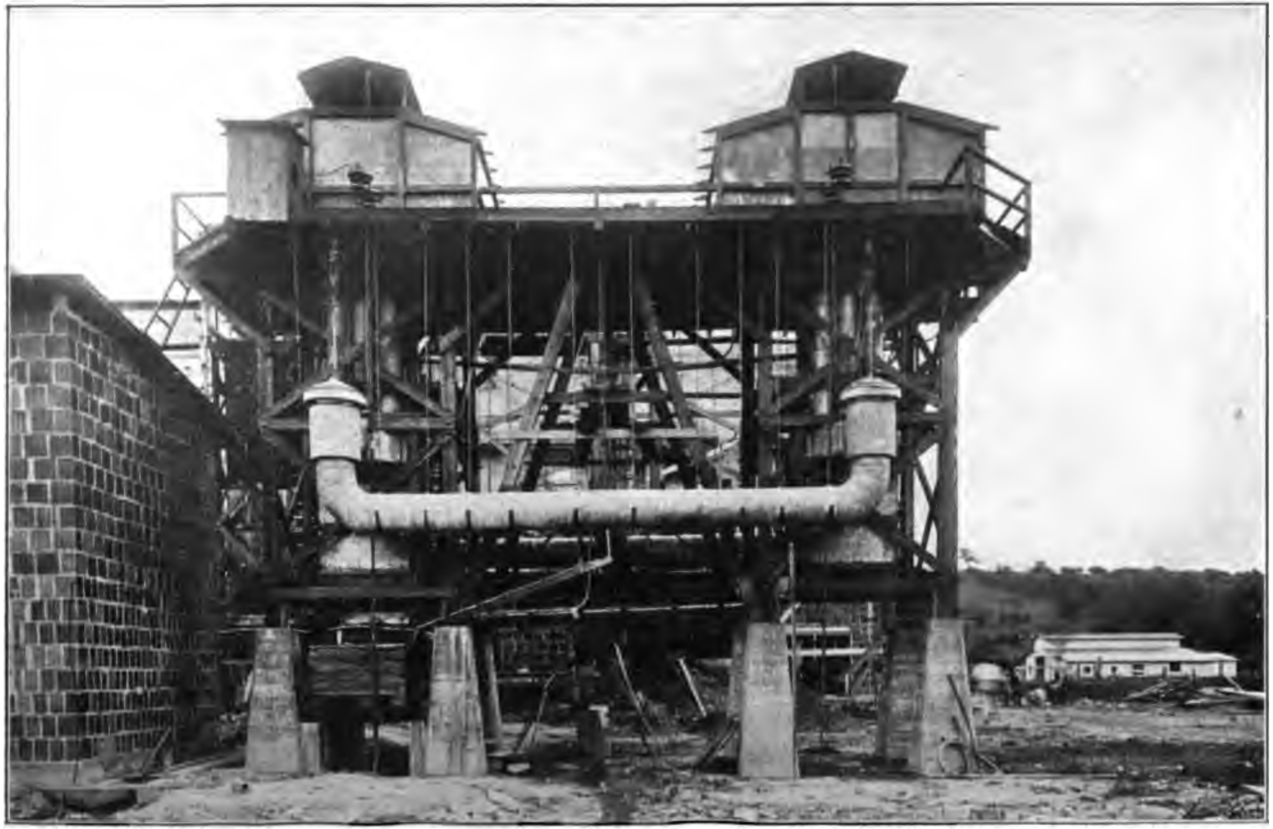
An electrical concentrator has been installed by the Chemical Construction Co. at Mount Holly, N. C., and has been operated inter-



A. ELECTRICAL PRECIPITATOR FOR SULPHURIC ACID FUMES. CURRENT ON.



B. ELECTRICAL PRECIPITATOR FOR SULPHURIC ACID FUMES. CURRENT OFF.



LARGE ELECTRICAL PRECIPITATION PLANT FOR REMOVING ACID MIST FROM GASES FROM SULPHURIC ACID CONCENTRATORS.

(By courtesy of the Research Corporation.)

mittently for several months with good results. During 1918 a 1-ton capacity unit was installed at a chemical plant at St. Albans, W. Va.

This concentrator is designed for small capacities where electrical current is available and comparatively cheap. It consists of a small bath space built of acid-proof masonry in which are placed two electrodes of acid-proof iron spaced about 2 or 3 feet apart, the electrodes being adjustable. The bath of acid is also so arranged that the level may be lowered or raised. There is a dam of acid-proof masonry between the electrodes. The weak acid is fed in at one end of the furnace near the electrode and flows over the dam to an outlet at the other end. The electric current between the electrodes passes through the thin layer of acid flowing over the dam and heats this thin layer to the point where the water is evaporated at a rapid rate.

USE OF ELECTRICAL PRECIPITATION PROCESS FOR RECOVERY OF ACID MIST OR FUME.

With most types of acid concentrators, Kalbperry towers, Skogland evaporators, or cascade systems there is always a considerable amount of acid mist or fume produced which is carried out by the furnace gases. This mist is difficult to catch completely in coke or other types of towers unless passed through weak acid or water in a scrubbing tower, when the resulting acid is so dilute that it is of little value. However, the discharge of acid mist into the atmosphere often leads to more or less serious complaints by people living adjacent to the plants and sometimes to litigation, resulting in the complainants procuring an injunction decree from the courts preventing further discharge of fumes.

The most efficient method of recovering the acid mist has been by electrical precipitation. The principle and mechanics of the process have been discussed under the subject of the recovery of dust and fume and will not be repeated here.

The precipators used for recovering acid mist are invariably of the pipe type and the material used is, of course, acid proof. Lead is nearly always used for the top and bottom headers, while the collecting electrode may be of lead or tile.

Plate IV, *B* (p. 67) shows an electrical precipitator erected for removing the acid mist from 3,000 cubic feet of gas per minute at 135° F., coming from three sulphuric-acid concentrators producing a total of 50 tons of 66° B. acid per 24 hours. Plate XII, *A*, shows an electrical precipitator with the current on, and Plate XII, *B*, with the current off. Plate XIII shows a large installation at a chemical plant in Tennessee.

One of the largest precipitation installations now in service for the removal of acid mist arising from sulphuric acid concentrators is one where the waste gases from 22 concentrators of the cascade type, each having a rated capacity of 10 tons of 66°B. acid per 24 hours, may be treated. The volume of gas cleared averages 30,000 cubic feet per minute at 180° F. and there is collected about 25 tons of 40° B. acid per day. The precipitator comprises four units, each having 12 collecting electrode pipes 12 inches in diameter by 15 feet in height. One set of electrical equipment of the usual type furnishes the power required by the installation.

In the following table there are listed the electrical precipitator installations that have been erected and satisfactorily operated for removing sulphuric acid mists from gases from concentrators. This table includes data on the number and type of towers with their combined capacities and feed, the recoveries and concentration of the recovered acid, and essential data on the size and operating conditions of the precipitators.

Data on removal of acid mists from concentrator gases by electrical precipitators.

Installation.	No. and type of concentrator.[a]	Capacity, tons of 66° B. acid per 24 hours.	Strength of acid feed, °B.	Strength of acid precipitated, °B.	Tons of acid precipitated per 24 hours.	Tons of acid precipitated reduced to 66 °B.	Percentage of total acid precipitated.	Number of pipes in precipitator.	Volume of gases, cubic feet per minute.	Temperature of gases, °F.	Cost of installation.
A.........	1-K	16	53	16	0.72	0.13	0.8	5	1,000	150	$3,000
B.........	2-K	43	53	16	1.6	.3	.8	10	2,000	150	5,000
C.........	3-K	37	53	16	1.85	.35	1.0	12	2,400	150	5,000
D.........	5-K	90	50	20	15.0	3.6	4.0	32	6,000	123	14,000
E.........	3-S	50	50	18	3.3	.7	1.4	16	2,640	135	6,500
F.........	1-S	40	60	33	1.75	.7	1.8	12	2,250	206	4,700
G.........	3-S	50-60	14.3	....	....	....	....	24	4,800	180	9,300
H.........	1-S	30	60	22	.7	.2	.6	12	3,300	190	5,000
I.........	4-S	40	52	32	3.0	1.2	3.0	20	4,360	155	....
J.........	2-S	22	50	30	7.5	5.01	22.7	16	2,400	220	5,000
K.........	22-C	170	60	45	25	14.8	8.7	48	35,000	200	29,000

[a] K, Kalbperry towers; S, Skoglund towers; C, cascade type.

Typical operating costs for tower "J" for one year.

Power (200 watts per pipe, 300 days, at 2 cents per kw.-hour)_	$460
Labor, 2 hours per day at 50 cents per hour________________	$300
Repairs (estimated)____________________________________	$200

With the exception of installations J and K, all precipitators were installed after the usual coke scrubbing towers and for the primary purpose of eliminating a nuisance. Installation J was made without coke scrubbers, but there was included in the system a cooling coil of 12-inch lead pipe, with return bends exposed to the air, having a total length of 125 feet.

When scrubbers are omitted the addition of such a cooling coil is advisable, because the precipitator efficiency is vastly improved when the gases are not hotter than 200 to 210° F. at the time of treatment.

The efficiencies of these installations have been consistently high. Continuous operation with clearances of 98 to 100 per cent have been maintained. Where scrubbers have been omitted, tests have shown over-all concentrator efficiencies of 96 per cent, based on the amount of acid passed through the tower, the amount of concentrated acid produced, and the amount recovered in the precipitator reduced to the basis of 100 per cent sulphuric acid.

ACID-PROOF MASONRY.

In the preceding pages considerable mention has been given to the use of acid-proof masonry in the construction of Glover, Gay-Lussac, various types of intermediate towers, and various concentrating towers. Most acid-plant constructors are now prepared to erect such towers with acid-proof brick or tile, and the success of this construction for these towers seems assured. However, the construction requires careful design, the use of superior and proper grades of material, and the proper treatment or curing of the cement used. Certain types of cement have recently come onto the market under various trade names, such, for example, as "acid-proof cement," recommended and used by the Chemical Construction Co., and "duro" cement, used by the Process Engineering Co. In using these cements sodium silicate is used as a binder.

One of the chief objections to this type of construction has been the liability of the tower walls to crack and develop leaks when the towers are subjected to any considerable differences in temperature.

One of the most recent designs of towers, etc., for hot gases and acids is that controlled by the Kalbperry corporation.

Referring to figures 17 and 18, it may be noted that the construction comprises an inner inclosure for the liquids and gases, composed of several relatively movable wall sections so that expansion and contraction can take place with minimum of cracking of these walls; that the inner inclosure is surrounded with an outer inclosure consisting of a single wall; and that these two walls are separated by an air space closed at the top, open for the passage of liquids to the interior of the structure at the bottom, but sealed at the bottom against passage of gases, thus making the air space dead.

The inner walls are supported by means of special brick which may be laid in either the outer or the inner wall; preferably in the outer, as the rounded projections then present only a line contact with the inner wall, and offer the least path for any liquid escaping through the inner wall to flow over to the outer wall.

It will be seen that this construction permits movement of the inner walls with comparative freedom from strain, as they are free to move in one direction, and that the tendency of the walls to crack is reduced to a minimum.

In the installation shown in the illustrations the inner and outer walls are joined by completing the masonry into a common wall, though this construction need not necessarily be followed, and the space at the top may be closed by some other form of cover connecting the two walls and yet providing for less rigid construction, if desirable. However, the rise of temperature at this point is very little above the normal; therefore the expansion is almost negligible.

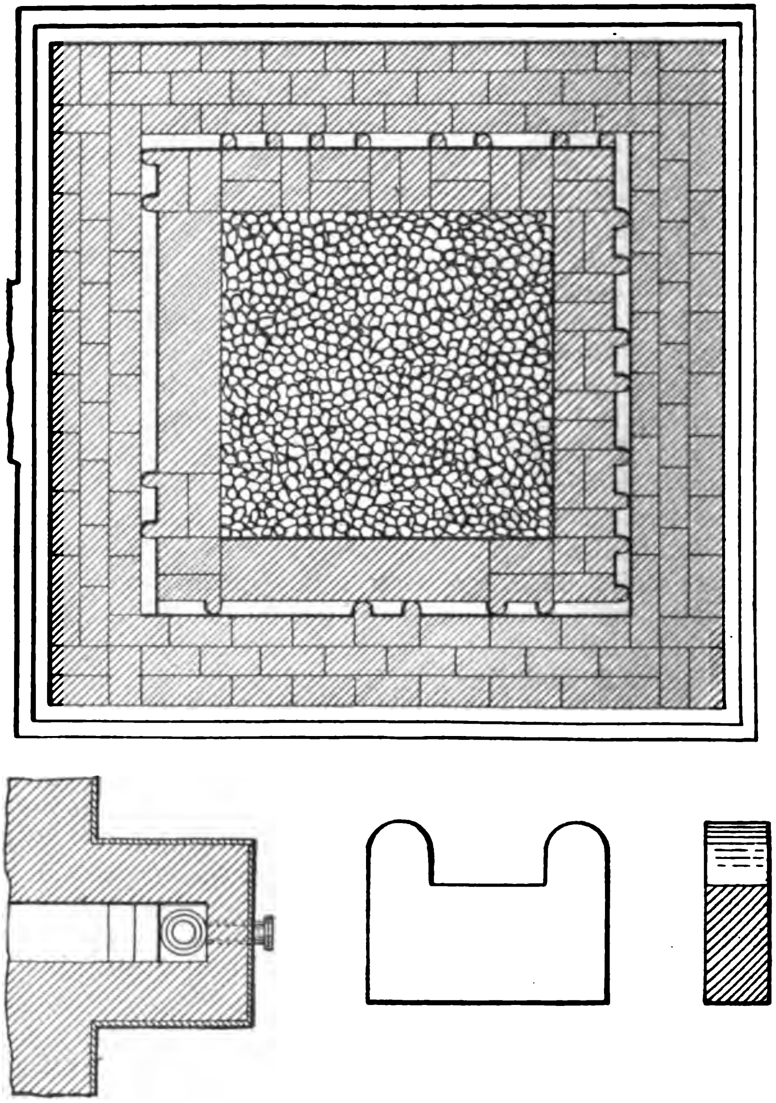


FIGURE 17.—Kalbperry, acid-proof masonry, cross section.

It is true that a small amount of liquid passes out through the open joints at the junction of the inner walls, together with that which finds its way through the inevitable cracks formed in the inner walls. The proportion of the total liquid content that comes in contact with the interior surface of the inner wall is, however, very small, and of that proportion only a small percentage will find its way through into the space between the inner and outer walls, so

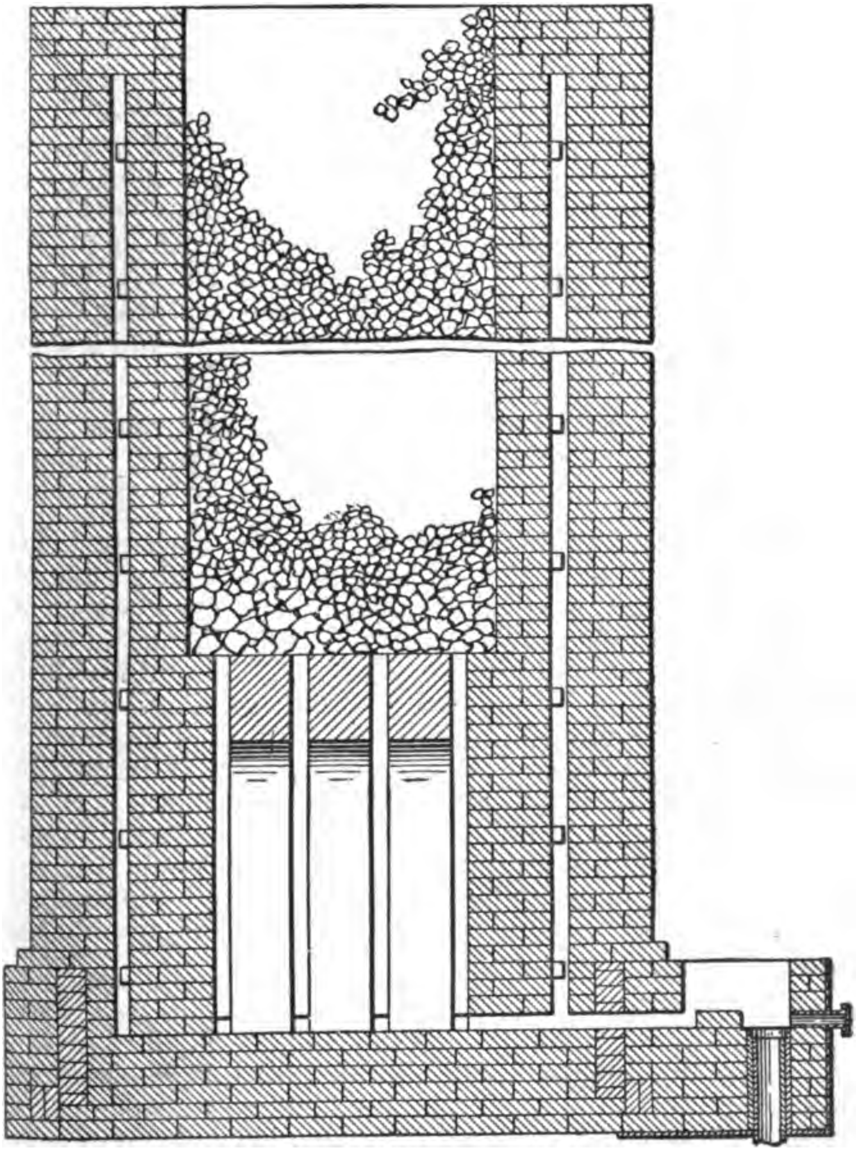


FIGURE 18.—Kalbperry acid-proof masonry, elevation.

that the total amount reaching that space and flowing downward between the walls is negligible.

On account of the dead-air space between the walls, the outer walls are maintained at a comparatively low temperature, with the result that there is little or no expansion of the outer walls. The base is inclosed in a metallic pan in order to guard against the escape of liquid through any cracks which might form in the base.

One advantage of this construction is that it is built throughout with standard brick, requiring a minimum amount of sheet lead, with no steel other than the four corner angles and the tie-rods. The corner angles are extended to carry the feed tank and feeding apparatus, which is not shown. The only part that is not standard stock material is the special brick having a semicircular lug formed on the side. These are not difficult to make, requiring only a simple die.

ACTION OF SULPHURIC ACID ON LEAD OR IRON.

ACTION ON LEAD.

Up to a strength of about 60° B. the action of sulphuric acid on lead is very slight, even when heated to near the boiling point. If the acid is boiled, however, the lead is strongly attacked. At strengths ranging from 60° B. (77.67 per cent H_2SO_4) to 96 per cent H_2SO_4, the action is still only slight in the cold. However, the action increases as the temperature rises, the lead being rapidly dissolved by the ordinary concentrated sulphuric acid at about 250° C. Monohydrate acid acts quite strongly and fuming acids energetically attack the lead even at ordinary atmospheric temperatures. At ordinary temperatures and even up to 100°C. the purest lead is least attacked by the sulphuric acid. Impurities, such as bismuth, antimony, zinc, or copper, have a deleterious effect, but for very high temperatures the addition of a little copper (0.1 to 0.2 per cent) to the lead appears to be of advantage.

ACTION ON ORDINARY CAST IRON.

Acids of all strengths from chamber acid to 100 per cent H_2SO_4 have very little action on cast iron at ordinary temperatures. If boiling, the weaker acids attack cast iron vigorously. The action decreases as the strength of the acid increases, until at 98 per cent H_2SO_4 the iron is scarcely attacked at all. Fuming acids below 20 per cent SO_3 have a somewhat greater action than 98 to 100 per cent H_2SO_4, but above that strength the action practically ceases.

Cast-iron vessels, however, are not suitable for the manufacture of fuming acids, owing to the fact that the free SO_3 penetrates into the pores of the metal, producing strains (probably due to the formation of gases in the pores by action of the acid and carbon) which causes the metal to break suddenly without any warning.

ACTION ON WROUGHT IRON.

Acids below 100 per cent H_2SO_4 act more rapidly on wrought iron than on cast iron, especially at high temperatures. However, in the cold the action is very slight with acids above 60° B. (about 78 per cent H_2SO_4). Wrought iron is somewhat attacked by fuming acids at a concentration of about 10 per cent free SO_3, but the action decreases as the strength of the acid increases and at 27 per cent free SO_3 it is negligible.

ACTION ON ALLOYS OF IRON AND SILICON.

Alloys of iron and silicon (tantiron, corrosiron, duriron) are much less attacked by boiling acids than is ordinary cast iron, and may be used in concentrating weak acids up to 98 per cent H_2SO_4. Fuming acids, however, energetically attack these alloys.

STORAGE TANKS.

It is desirable to have at the head of each Glover tower or Gay-Lussac tower at least several hours' supply of acid. Tanks at the bottom of these towers should have at least a day's capacity, and the tanks for chamber acid may be of any capacity necessary for the economical operation of the plant. Plants producing acid for the custom market usually have ample storage to allow for the fluctuation in sales or for delays in delivery of cars, etc.

The low-strength acid storage tanks are generally of wood, lined with lead weighing 6, 8, or 10 pounds per square foot. Acid-proof chemical brick or tile may also be used for lining the tanks.

Closed storage tanks for 60° B. acid are made of steel or wrought iron, these materials being suitable where no air can enter, the moisture of which might dilute the acid.

Acid of 66° B. strength or higher is generally stored in riveted steel tanks, emptied either through a foot valve in the bottom surrounded by a low upstand to prevent the drawing of mud, or the tank has draw-off valves at various levels on the sides. These tanks are usually placed on structural steel or on concrete supports high enough so that the acid will run out into cars by gravity. A blow-off pipe about 2 inches in diameter should be provided near the center of the tank and extending fairly well down away from the manhole plate, so that the blast of air which follows the blowing of an "egg" into the tank may find free access to the outside atmosphere.

Storage tanks, especially for low-strength acid, may be made of reinforced concrete, the inner surface of which is painted with pitch and lined with lead.

In the foot-valve arrangement, a porcelain plug and seat is commonly used. The seat is arranged in place and supported by a wooden block, then molten sulphur is poured in around the seat to close the spaces between it and the concrete. The plug valves are operated either by screw stem or by lever. Asbestos-seated iron plugs or corks are frequently used where frequent opening and closing is necessary.

Sulphuric acid is shipped in tank cars, tank wagons, drums, and carboys. Tank cars have capacities of 60,000 to 160,000 pounds. They are usually provided with a small pump or well into which a "blow-off" pipe dips to empty the tank as completely as possible. Sometimes a foot valve or cork is provided on the bottom of the tank for emptying, but the better practice is to blow the acid out of the tank with compressed air. The tanks are usually provided with a dome having a manhole plate, the blow-off pipe being at one side of the manhole and the pressure air pipe at the other side, both being provided with a flanked flanged union, with a cork and a cap to protect the threads.

Drums are of various sizes, holding between 500 and 1,500 pounds of acid. Carboys are glass bottles of 10 to 12 gallon capacity, protected from breakage by a casing of some sort, and hold about 180 pounds of 66° B. acid.

CONTACT PROCESS FOR MANUFACTURE OF SULPHURIC ACID.

GENERAL DISCUSSION OF THE PROCESS.

Although the reaction between sulphur dioxide and oxygen is almost imperceptibly slow, even at 400° C., in the absence of a catalyst, yet by the presence of certain catalysts the reaction is brought about quite rapidly. A catalyst does not initiate a reaction or change the final equilibrium existing between the reacting substances; it merely affects the velocity with which the reaction occurs.

The contact process for the manufacture of sulphuric acid is based upon the fact that if pure gaseous sulphur dioxide and the proper proportion of oxygen are heated together in intimate contact with finely divided platinum, ferric oxide, or other catalytic material, a more or less complete and rapid oxidation of SO_2 to SO_3 will take place, providing the temperature of the reaction during the contact is not allowed to rise to the point of dissociation of SO_3—that is, to the point where SO_3 will break up into SO_2 and O. The SO_3 vapor formed by the reaction can then be recovered by cooling and by absorption in a solution of strong acid.

The various contact materials, besides metallic platinum, which have been tried as catalysts include oxides of iron, chromium, tin, bismuth, tungsten, titanium, molybdenum, thorium, and vanadium. With the exception of ferric oxide, which has been used for one application of the contact process known as the "Mannheim" process, none of these has been successfully used. Ferric oxide, moreover, has not been as successfully used as has platinum, for the following reasons:

From numerous carefully observed and recorded experiments it has been determined that the temperatures which, under normal pressures, yield the highest conversion to SO_3 with any practicable mixture of SO_2 and air, range from 425° to 450° C. Above these temperatures the SO_3 does not completely form or that which is formed begins to decompose again into SO_2 and O_2. Platinum at these temperatures has the desired catalytic effect—that is, it increases sufficiently the velocity of the reaction, $SO_2+0.5O_2=SO_3$, to produce within a reasonable time almost quantitative conversion to SO_3. On the other hand, iron oxide at these temperatures does not exhibit the same sufficient catalytic action by way of increasing the velocity of the reaction as does platinum, and its use is not practicable at these temperatures. Only at 600° C. does the iron oxide become sufficiently active as a catalyst to permit its use. However, at such temperatures the reaction is not complete or the SO_3 is largely broken down into SO_2 and O_2 again. In fact, the maximum yield obtainable, both from theoretic considerations and observed phenomena, is only about 70 per cent SO_3. In practice the yield is more nearly 40 to 50 per cent.

Thus, platinum is the most effective contact substance now in use, and the contact-acid industry of the country is based on the use of that material in one form or another.

A mixture of sulphur dioxide and oxygen reacts energetically when first brought into contact with the heated platinum, but the reaction takes place more and more slowly as an increasing percentage of SO_3 is formed, and the final conversion of SO_2 into SO_3 is only attained by allowing the reacting gases to remain in contact with each other in the presence of the platinum for some considerable time. The higher the temperature the more rapidly is the final conversion attained, but as the back action ($SO_3=SO_2+O$) increases rapidly at the higher temperatures, the less favorable is the final result at these temperatures. This is shown clearly in figure 19, giving the equilibrium maximum values for the conversion of SO_2 to SO_3 obtained by Bodenstein and Pohl, as stated by Martin.[a]

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[a] Martin, Geoffrey, Industrial and manufacturing chemistry, Part II, Inorganic, Sulphuric acid (conditions for technical success, pp. 241–242), vol. 1, 1917, pp. 207–256.

TYPES OF PLANTS IN USE.

There are four general types of contact-process acid installati in use in this country, known, respectively, as the Mannhe Badische, Grillo-Schroeder, and Tentelew. In all of these proces many of the individual steps in the manufacture are similar, frequently the same apparatus is utilized. The mechanical appli tion of the principle involved varies according to the individ ideas of the designer, so that, as a whole, the processes are mo less similar or interchangeable. This applies especially to the

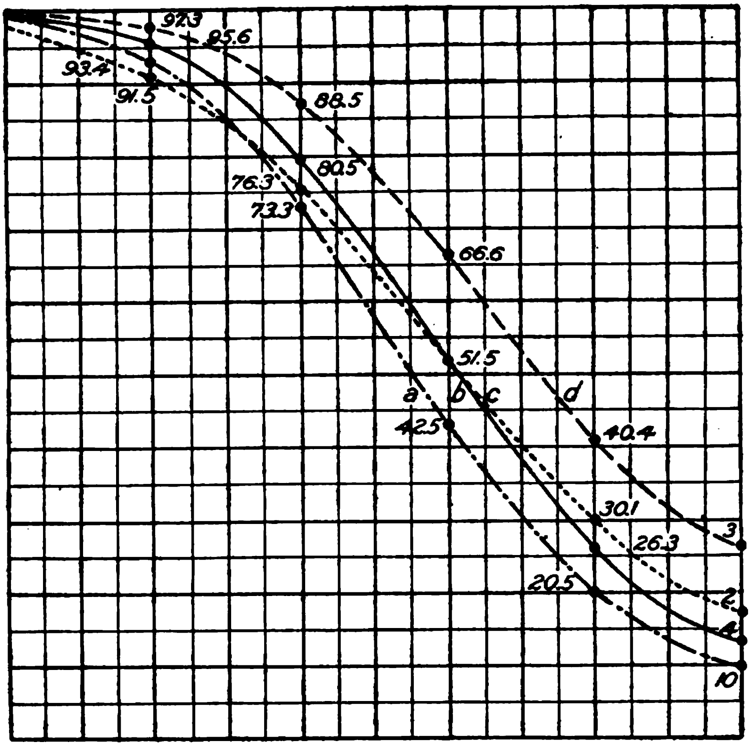


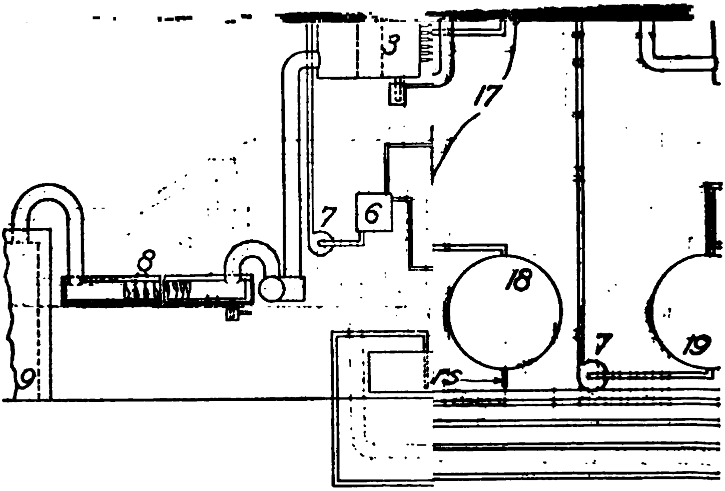
FIGURE 19.—Diagram for conversion of SO_2 to SO_3 (after Bodenstein and Pohl).

three processes mentioned, all of which employ platinum as the sole material for obtaining oxidation.

The Badische and Tentelew systems differ from the Grillo-Schroeder especially in utilizing asbestos instead of magnesium sulphate as the carrier for the platinum.

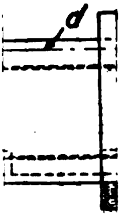
The Tentelew system differs from the Grillo-Schroeder and the Badische especially in its heat-transferring and gas-preheating apparatus.

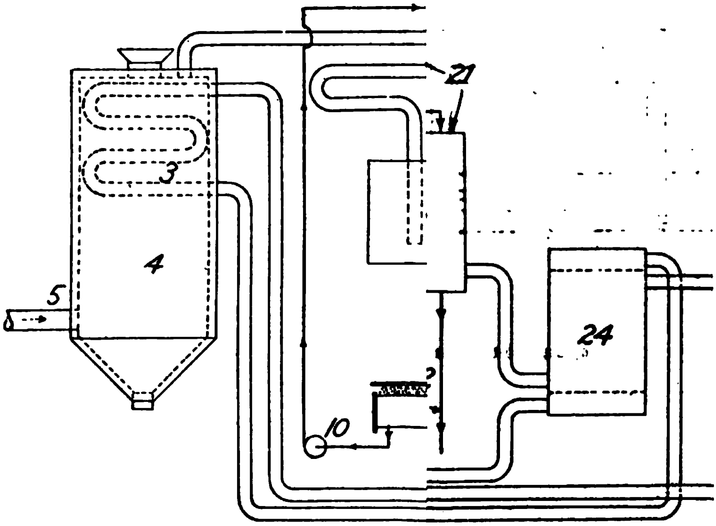
The Mannheim system differs essentially from the other three in that ferric oxide is used to obtain a part of the oxidation, and



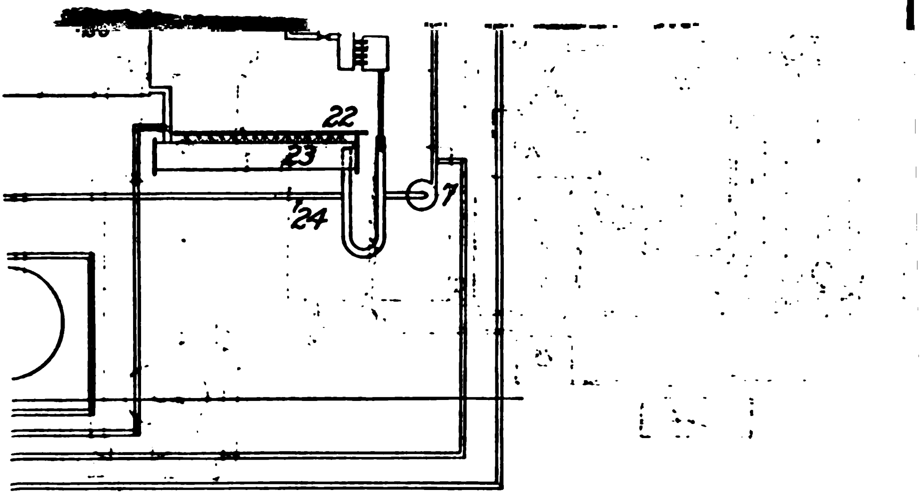
case; *15*, sum
old); *35*, SO$_2$ (

1, Cooling water; *2*, water overflow; *3*, scrubber; ace; *15*, SO$_2$ cooling pipes; *18*, a,

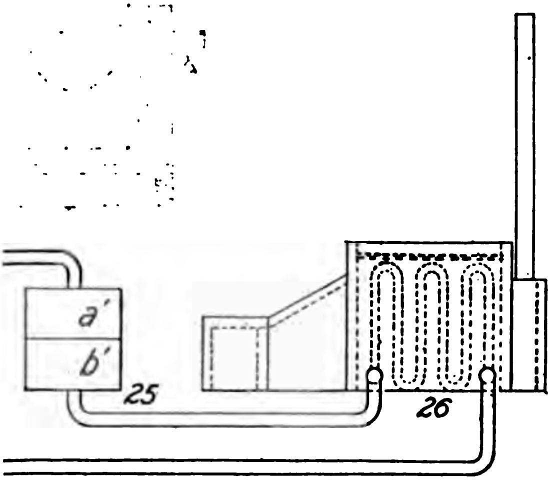




1, Weak acid tank; *2*, gas coolers; *3*, heat transfer; *4*, sewer; *14*, blow case; *15*, sump;
, preheating furnace.



15, converters; 17, a, b, oleum towers; 22, oleum storage;



16, blower; *17*, *a*, *b*, *c*, filters; *18*, drier; *19*, waste gas stack;

this method necessitates a double absorption system and material changes in the design.

Briefly, the four types of plants include the following units:

Badische system (see Pl. XIV, *A*):
  Pyrite ore roasters or sulphur burners.
  Dust-catching installation.
  Vertical lead-pipe cooling installation.
  Gas-scrubbing installation.
  Coke filter.
  Gas-drying tower.
  Blower.
  Converters.
  Vertical tubular heat transfers.
  SO_3 gas-cooling system.
  Absorption towers.
  Oleum towers.

Grillo-Schroeder system (see Pl. XV, *A*):
  Pyrite ore roasters or sulphur burners.
  Dust-catching installation.
  Vertical or horizontal lead-pipe cooling installation.
  Lead-coil gas cooling and scrubbing towers.
  Asbestos, mineral wool, sawdust, or coke filtering system.
  SO_2 gas-drying tower.
  Blower.
  Preheating furnace.
  Converters, which may or may not be designed as heat transfers.
  SO_3 gas-cooling system.
  Absorption towers.
  Oleum towers.

Tentelew system:
  The Tentelew system is essentially the same as either the Badische or Grillo-Schroeder systems, or a combination of both, except that its heat transfer and preheating system differs radically from that used in either of the other processes, as has been previously described.

Mannheim system (see Pl. XV, *B*):
Lump-ore burners, to which a certain proportion of sulphur burners may be added, if desired.
  A ferric oxide shaft, together with heat transfer or forewarming chambers.
  Oxide shaft coolers and sludge settlers.
  Oxide absorption towers.
  Fan.
  Acid catchers.
  Gas filters.

Preheaters or heat transfers.
Superheaters.
Platinum shafts.
Final absorption towers.
Oleum towers.

The New Jersey Zinc Co. was the owner of the Grillo-Schroeder patents, the main features of which expired in 1918. It used them in connection with the manufacture of acid from its zinc ores, and also issued licenses to other companies in the United States.

The Badische, Tentelew, and Mannheim patents are owned or controlled by the General Chemical Co. At one time objection was raised by the General Chemical Co. as to the right of the New Jersey Zinc Co. to use and to license for others the use of the Grillo-Schroeder process, and suit was commenced. However, an agreement was reached which, while allowing the New Jersey Zinc Co. and its licensees to continue to operate, gave the precedence for future licensing to the General Chemical Co. Although many of the features of these patents have expired, the General Chemical Co. claims still to control the process until 1923 and issues a license and requires the payment of royalties for the installation and operation of all contact plants, including those operating under the features of the Grillo-Schroeder patents.

ESSENTIAL CONDITIONS IN MANUFACTURE OF ACID BY CONTACT PROCESS.

The contact process, as practiced in this country for the manufacture of sulphuric acid, is based upon the two following essential facts:

1. When the sulphur dioxide (SO_2) gas, mixed with a suitable proportion of oxygen, is passed over heated platinum in a state of very fine subdivision, the reaction $2SO_2+O_2=2SO_3$ takes place, forming sulphur trioxide or sulphuric acid anhydride (SO_3).

2. Sulphur trioxide is quantitatively absorbed by sulphuric acid solution of between 97.5 and 99.5 per cent H_2SO_4 content, resulting in the uniting of the SO_3 with the excess water in the sulphuric acid solution and the consequent formation of sulphuric acid (H_2SO_4).

Generally speaking, the range of sulphur dioxide strength in the gases treated in contact plants varies from 4 to 7½ per cent SO_2 by volume. As a large excess of oxygen above the theoretical is necessary for complete oxidation of sulphur dioxide by the contact process, when burning pyrite it is not safe to have the SO_2 content of the gas higher than 7.5 per cent, otherwise the oxygen will be too low. When brimstone is burned as the source of sulphur dioxide, the gas will contain a higher proportion of oxygen in relation to its sulphur dioxide content than when burning pyrite; therefore, a gas of higher sulphur dioxide content (up to 8½ or even 9 per cent) may be utilized.

The gases, whether derived from the oxidation of pyrite or from the burning of sulphur, must be thoroughly cleaned from all solid impurities or fumes before entering the catalytic material in order to avoid the contamination of this material and consequent loss of efficiency. The gases must also be freed from certain gaseous impurities which have an inhibiting effect upon the oxidizing power of the catalyzer. A certain amount of sulphur trioxide (SO_3) will always be present in the gases, and this should be completely removed. The gases will be saturated with sulphuric acid in proportion to their vapor tension at the temperature at which they are being treated, and this sulphuric acid should be removed as far as possible by dehydrating the gases with strong sulphuric acid before they are permitted to enter the catalytic material. This latter precaution is not especially essential but is highly advisable in order to prevent the deposition of sulphuric acid throughout the system prior to entering the absorption towers, as the condensing of acid upon a steel or cast-iron system results in continuous and heavy deterioration of plant. Oxidation of the sulphur dioxide to sulphur trioxide with platinum catalyzer begins at a temperature of about 360° C., but, as stated previously, in ordinary working practice it is customary to carry this temperature considerably higher, say about 420° C. If the platinum catalyzer is foul or "poisoned," its activity may be considerably increased by raising the temperature of the gases, and in some instances this has been done even to as high as 550° C. This procedure is not advisable, however, and the catalytic material should be removed and revived by proper treatment before its efficiency has become so impaired.

The oxidation of sulphur dioxide to sulphur trioxide is a very exothermic reaction, and as this reaction is also reversible at high temperatures care must be taken that in the so-called converter itself the temperature is not allowed to rise too high (preferably never above 550° C.) in order that the oxidation may be maintained at its highest efficiency.

The gases, containing sulphur trioxide, after leaving the converter, should be cooled before entering the absorption installation, preferably to a temperature of 50° or 60° C. or lower. The sulphuric acid used for absorption is heated both by the sensible heat of the gases passing through it and also by the heat of formation of the sulphuric acid formed by the uniting of the sulphur trioxide with the water in the acid solution. This acid must be continually cooled and preferably held down to a temperature of 40° C. or 50° C., as sulphur trioxide is not readily or completely absorbed in sulphuric acid solution when the temperature rises too high.

The strength of the absorbing acid must be very carefully maintained and should never vary more than 1 per cent either way from a content of 98.5 per cent H_2SO_4.

If oleum (fuming sulphuric acid) is to be manufactured, this is accomplished by passing the cool gases containing SO_3 through strong sulphuric acid until the acid, through absorption and solution of SO_3, has reached the desired strength. This solution of sulphur trioxide in sulphuric acid to produce oleum also generates heat, and suitable cooling apparatus must be installed and operated in order to attain oleum of desired strength.

COOLING THE SO_2 GASES.

The precipitation of the heavier dust and fume is fully discussed elsewhere in this bulletin under a separate heading, and will not be considered further at this point. The gases, containing a relatively small proportion of impurities, should be drawn from the dust and fume catching installation at a temperature in the neighborhood of 280° C. and then go into a lead cooling system. The first part of this lead cooling system generally consists of large and heavy-walled pipes, banded at frequent intervals on the outside with steel bands, which in turn are covered with thin sheet lead securely burned to the main lead pipe. This banding is necessary to prevent collapse of the large lead pipes, which are under a partial vacuum caused by the suction of the blower further along in the system. The lead pipes are water cooled and the sheet-lead covering of the bands is necessary not only to hold the lead pipes against the bands and maintain their form, but also to keep the cooling water away from the bands themselves, as, especially if impure or salt water be used for cooling, an electrolytic action is set up between the steel and the lead, and the steel band is rapidly eaten away and becomes useless. The lead pipes are usually 12 to 20 inches in internal diameter and a number of them are installed in parallel, the number and size depending upon the amount of gas to be handled, its temperature, and the individual ideas of the designer.

In some plants the lead pipes are installed horizontally, and in an installation of this type (see Pl. XIV, *B*, p. 150) to handle a large amount of gases, the pipes are usually made of large diameter and very long in order to obtain the cooling service required with a minimum installation cost. These pipes may be either submerged in water boxes or sprayed. There are several disadvantages connected with this form of installation, because a considerable amount of very fine flue dust, fume, together with sulphuric acid, is precipitated in the pipes. The sulphuric acid may be removed by means of "boots" installed at frequent intervals along the bottom of the pipes, but enough does not condense to wash out the precipitated dust and fume. Consequently large cleaning holes have to be installed in the tops of the pipes, and the covers of these holes have to be removed and the pipes thoroughly flushed out with water at frequent intervals.

A more efficient and less troublesome type of installation is parallel sets of vertical banded lead pipes, usually about 12 inches in diameter, running from a common header above to a header below. Several such sets are constructed side by side with the headers of each set connected alternately at the top and bottom with the headers of the next set. The gases usually enter the top header, pass down through the lead pipes in parallel into the lower header, pass from that header into the lower header of the next following set, thence up through the lead pipes of the second set into its top header and from there into the top header of the third set, etc. The vertical pipes are sprayed with water and the bottom headers of each set are provided with overflow "boots" of large size to permit draining off the condensed acid and also to permit opening one end and quickly and thoroughly flushing out the accumulation of dust or fume from time to time. The size of the vertical lead pipes is diminished in each succeeding set, as the gas volume diminishes due to the lowering of the gas temperature, but the number of pipes in each parallel set is usually the same. This

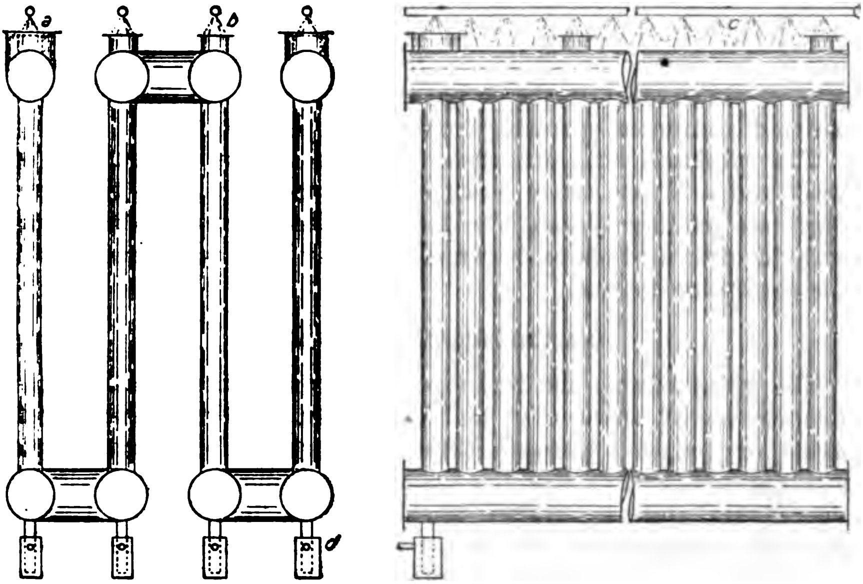


FIGURE 20.—Vertical lead cooler for SO_2 gases. *a*, SO_2 inlet; *b*, water spray; *c*, washout holes; *d*, drain.

type of installation (fig. 20) is decidedly more expensive to erect than the horizontal type, but is much more efficient and less costly and troublesome in operation.

Great care must be taken in building the connection between the dust chamber and the lead system, as the temperature of the gases must be maintained at about 280° C. to avoid condensation of acid in the brick, concrete, or steel dust chamber. At times the gas temperature may rise considerably higher than this, bringing it to a point perilously close to the melting point of lead. An expensive but very good type of connection is lead-covered terra-cotta pipe, the terra cotta not being acted upon by any condensing acid or by the heat and serving to keep the heat to a large extent away from the lead covering. This type of connection may be installed as far as that point where the construction permits continuous water spraying of the lead, when all danger from overheating passes. Special care should be taken in the design of this part of the plant, in order to avoid continuous operating troubles and plant repairs.

The sulphuric acid condensed in these coolers is usually very weak and is either run to waste or more preferably run through a duplicate settling system, the dust and dirt allowed to settle out, and the clear acid above drawn off into a "blow case" and used in the absorption towers.

SCRUBBING THE SO_2 GASES.

The gases leaving the lead-pipe cooling system are usually at a temperature of between 40° and 70° C. In addition to sulphur dioxide, oxygen, and nitrogen, these gases are liable to contain some residual dust, lead or zinc fume, arsenic, selenium, or sulphuric-acid vapors, and chlorine, arsine, or silicon tetra fluoride, and possibly even other impurities. All of these impurities must be removed if a plant is to operate without interruptions and at high efficiency. Practically all of these impurities may be removed by an extremely thorough scrubbing with sulphuric-acid solution of fairly low strength. Many of the impurities, such as the dust, various fumes, and some of the deleterious gases, may be removed by scrubbing with nearly any strength of acid, but chlorine, which is one of the most common and subtle contact poisons. is not wholly removed by scrubbing with strong acid, hence it is advisable to scrub with an acid of less than 30° B. Scrubbing with such a weak acid has the disadvantage, however, of leaving in the gases a considerable amount of water vapor, which later on is precipitated as sulphuric acid and causes serious trouble. For this reason, especially, it is advisable to constantly test the scrubbed gases for chlorine content and to scrub with as strong an acid solution as practicable, at the same time removing all of the chlorine.

Many methods of scrubbing have been tried, such as spray towers, vapor towers, perforated plate towers, lead-coil cooling and scrubbing towers, and bubblers or washing towers, but of all these various types only the last two have proved completely satisfactory and effective.

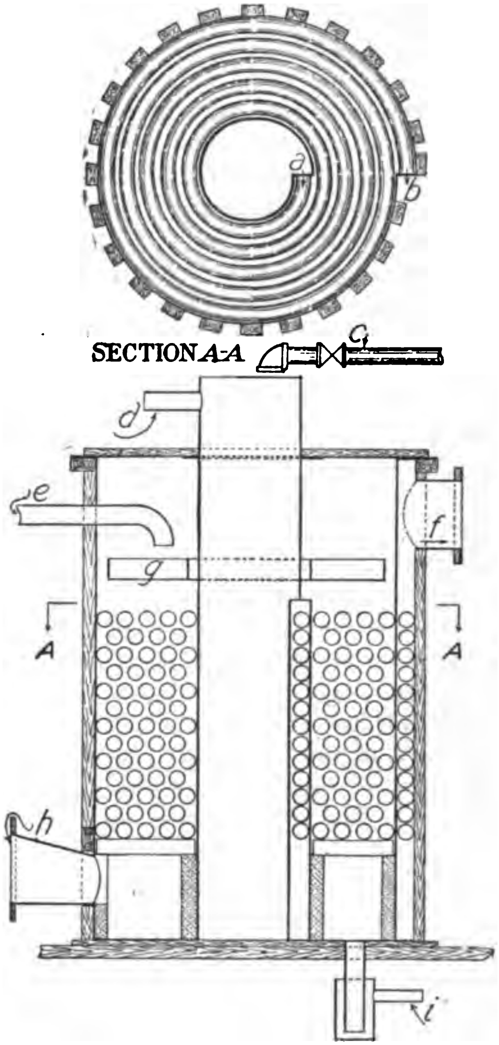


FIGURE 21.—Lead-coil cooling and scrubbing system; *a*, water inlet; *b*, water outlet; *c*, cooling water; *d*, water overflow; *e*, acid inlet; *f*, gas outlet *g*, pan; *h*, gas inlet; *i*, acid outlet.

LEAD-COIL COOLING AND SCRUBBING TOWER.

There are several modifications of the lead-coil cooling and scrubbing system, all fairly effective. One of the best designs (see fig. 21) comprises an annular space between an outer and inner vertical lead shell, this space being filled with spirals of lead pipe with very little clearance between the pipes—not more than one-fourth to three-eighths inch. Each spiral is staggered in relation to the spiral just under it, so that the center of the pipes in one spiral is always just over the center of the orifice between the pipes in the spiral below. Fifteen to 30 of these spirals, as necessity may demand, are superimposed one over the other in the space between the outer and inner lead shell mentioned. One end of each spiral is burned into the wall of the inner shell, which serves for a reservoir for water supply. The other end of the spiral protrudes through and is burned into the wall of the outer shell. The inner shell is kept filled with water; the flow of water through each spiral is regulated by means of a valve attached to the end that protrudes through the outer shell. The hot, dirty gases enter the base of this tower and pass upward between and around the water-cooled spirals. In this manner the cooling water does not come into actual contact with the gas and impart moisture to it. Weak sulphuric acid enters the top of the tower and by means of a distributing pan is showered down over the water-cooled coils and against the upcoming hot, dirty gases. This scrubbing acid serves two functions. It removes all dirt, fume, and deleterious gases from the sulphur dioxide gases and leaves in the gases only moisture, in proportion to the vapor tension of the strength of sulphuric acid used at the scrubbing temperature. It also acts essentially as a cooler. The heat of the gases is not transferred through metal into water, which would only result in a transfer rate of approximately 2 to 3 B. t. u. per square foot of cooling surface per degree Fahrenheit difference in gas and cooling water temperatures in one hour's time, but goes directly into the scrubbing acid, which, in turn, can at no point drop more than one-half or three-eighths of an inch before coming into contact with another water-cooled lead surface. As a result the rate of heat transfer is greatly increased, ranging in actual practice from 20 to 80 B. t. u. per square foot per degree Fahrenheit difference per hour, or from 100 to 400 kg.-calories per square meter per degree centigrade difference per hour. The rate varies considerably with the speed of the gases and the fineness of division of the scrubbing acid in its downward passage through the coils.

The acid is discharged from the bottom of the tower through a trap into one of a duplicate pair of lead-lined settling tanks. The dirt, fume, and other solid impurities settle out and practically clean acid overflows from the further end of the settling tank, and is returned to the top of the scrubbing tower by means of a pump or air lift and reused for scrubbing. When the tank of acid has become too foul or saturated with chlorine, the alternate tank filled with fresh acid is cut in, and the tank of dirty acid allowed to settle. After settling, the clean acid above is drawn off and blown to the absorbing towers, the sediment is washed out into the sewer, and the tank filled with fresh acid. The strength of the scrubbing acid, as before stated, must be carefully regulated, which is done by the addition of water, and care must be taken that this water is very low in chlorine. The great advantage of this type of tower is effective cooling of the gases without cooling water coming into contact with the gases, so that the amount of moisture carried forward by the gases into the drier is comparatively small.

"BUBBLERS" OR WASHING TOWER.

In the "bubbling" or "washing" system of gas scrubbing, also, methods of application differ according to the individual ideas of the designer. One method comprises introducing the gas into the base of a lead-lined tank or tower filled with water or weak sulphuric acid, where the gas stream is broken by means of a perforated plate extending across the tower above the gas inlet, or other suitable contrivance, into small streams or bubbles that rise through the scrubbing liquor and are cleaned thereby. This method is efficient but requires a large expenditure of power to overcome the head of the liquid in the tower.

Another method involves filling the tower with a suitable distributing filling such as is used in a Glover tower, and continuously circulating the scrubbing liquor countercurrent to the rising stream of gases by means of a pump. In either method clean water or weak acid must be continually added to the liquor and part of the liquor allowed to overflow, or else the whole charge of liquor must be changed as soon as it becomes foul.

The great disadvantage of this system is that there is no internal cooling of the scrubbing liquor during the scrubbing. It is practically impossible on a large commercial scale to cool the gases in the large lead-pipe coolers to lower than 30° C., consequently the scrubbing liquor itself soon becomes heated and the gases leave the liquor at the same temperature at which they enter. This results in the gases absorbing a large proportion of moisture from the weak, warm scrubbing liquor and is equivalent to adding that much steam to the gases. The temperature of the gases being still above atmospheric, they will continue to be cooled in the filtering and spray-catching system; a large amount of very weak acid will be precipitated out and a great deal of moisture will also be carried over into the drying tower. The net result is that more water is introduced into the gases than is allowable if the total output of the plant is desired to be in the form of fuming sulphuric acid (oleum). This excess moisture will occur as weak acid drips from the lead-pipe coolers and from the filtering and spray-catching system, as weak acid overflow from the scrubbing tower, and as moisture which must be removed in the drying towers. If the total amount of water which comes out of the system in the form of weak acid is too large to be completely utilized in the absorbing towers, and produce the high-strength acid desired, the excess over the amount actually needed must be thrown away, resulting, of course, in the loss of its sulphuric acid content. In some plants this excess of weak acid solution is concentrated by heaters and then used, but this plan is not desirable unless absolutely necessary.

FILTERING THE GASES.

The gases, after leaving the scrubbing system, carry more or less acid spray or mist, and also occasionally some impurities which have not been completely scrubbed out, such as traces of selenium, lead, zinc, and arsenic. In order to insure that any or all of those foreign materials, if present, are removed the gas is filtered. This filtering is performed in several different ways and with several different types of installation.

COKE FILTER.

One type of apparatus which has proved very successful and is used quite extensively is the coke filter (fig. 22). This is nothing more than a very large rectangular lead-lined box filled with carefully sized and washed coke. For filtering a sufficient volume of gases to produce 30 tons of sulphuric acid daily, this box would be about 30 to 40 feet wide, about 50 to 60 feet long, and about 12 to 15 feet deep. The sides, ends, top, and bottom are lead lined throughout. The bottom is not flat, but slopes slightly toward the center from both sides, and a shallow drain or trough runs longitudinally through the center of the bottom for its full length and discharges at one end through a boot or trap. This central drain and discharge serves to carry off the precipitated weak acid, together with whatever dirt or mechanical impurities is washed down with the acid. The gas entrance is situated centrally in one end and near the bottom; the discharge is in the other end and usually near the top. A large gas-diffusing space is usually constructed around the gas inlet and outlet on the inside of the filter box. This may be so constructed as to give a large area for uniform diffusion of the gases into the coke and still not become plugged with the fine coke. A grill is also built over the discharge trough in the center of the bottom. The whole box is filled completely with carefully sized and washed coke. One-quarter-inch to three-eighths-inch lumps are used, all fines being carefully washed out. After the coke is all in and well settled into place, the lead top is put on and burned onto the sides. Lead strips or lead-covered ribs extending across the filter box on the under side of the top and projecting well down into the coke should be installed at frequent intervals, so that if there is any further settling of the coke after the top is burned in place the gas will not have an uninterrupted flow through the open space left between the coke and lead cover.

The gas enters at one end of the filter box, diffuses into the coke, and traverses the coke-filled box longitudinally, finally going out at the other end.

The coke catches all the spray and mist, also whatever fume has not been scrubbed out, and these trickle down and are discharged from the drain in the bottom of the filter box.

This type of filter is expensive to install, but is self-draining and operates satisfactorily, providing the gases are scrubbed very free from solids, especially lead and arsenic. If this is not done, washout holes may be made in the top of the filter box, and the soluble solids and some of the insoluble solids partly washed out from time to time. However, such operation is not very successful, owing to channeling of the water, and if any large accumulation of solids,

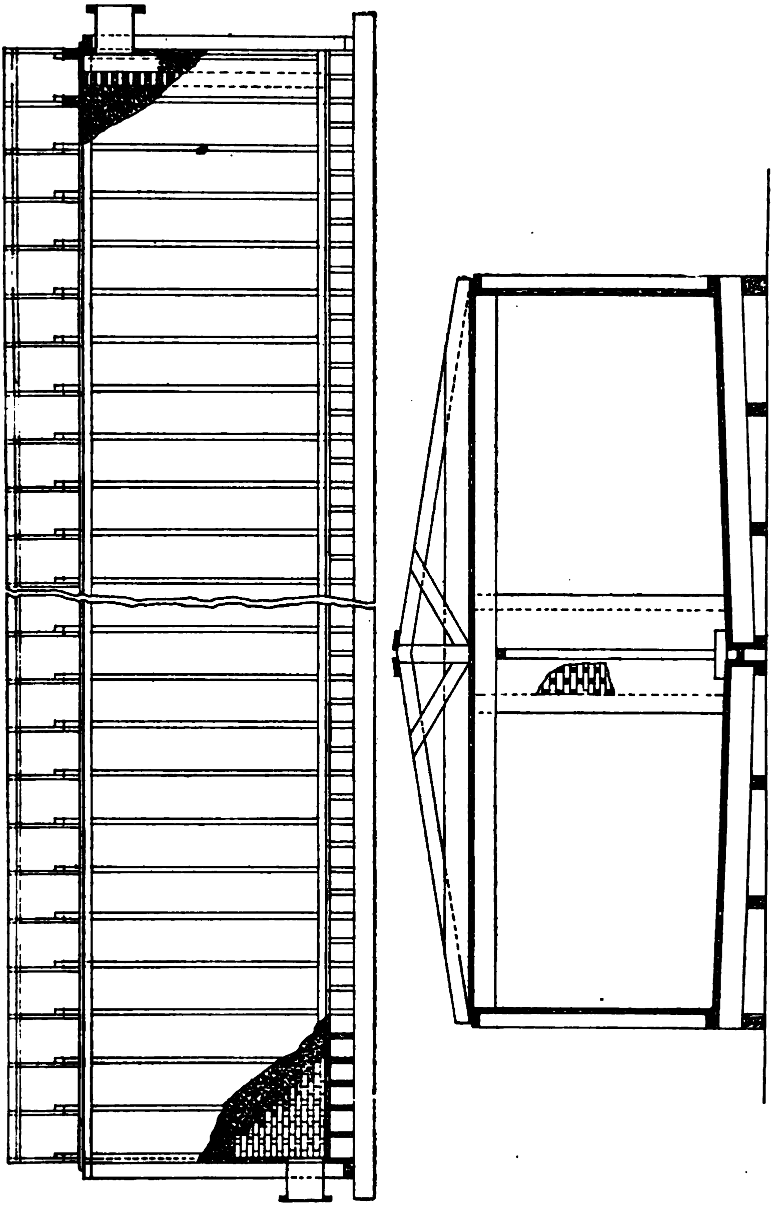


FIGURE 22.—Coke filter for purifying gases from scrubber.

especially lead fume, gets by the scrubbing system the coke filter will eventually plug, which necessitates taking the top off and renewing the coke. This is expensive and also necessitates a plant shutdown of considerable duration unless a duplicate filter is installed, which is a heavy addition to the installation cost.

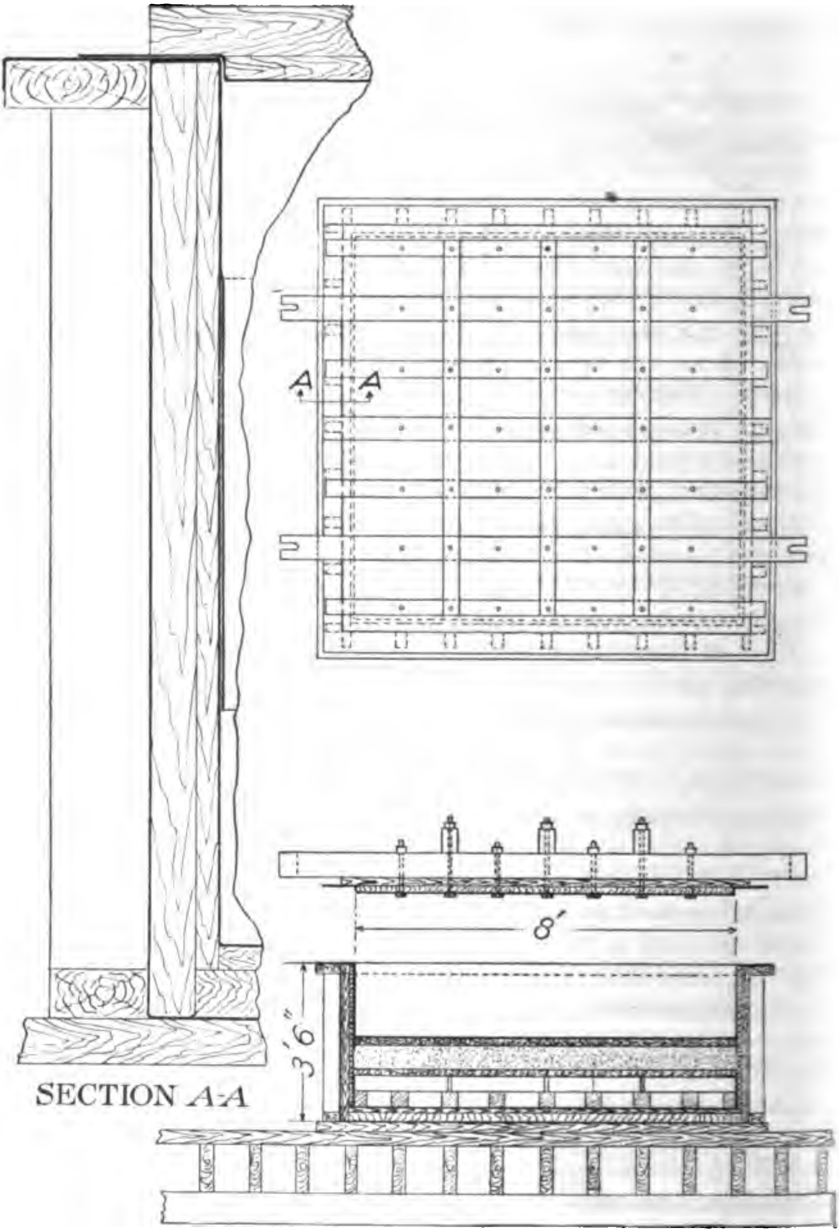


FIGURE 23.—Cross section of filter.

LEAD-LINED FILTER BOXES.

Another system of gas filtration which has proved very successful comprises a large number of small, lead-lined filter boxes generally arranged in sets of three in series, and as many sets as the quantity of gas to be filtered demands. (See fig. 23.) In addition, one or two extra sets are usually installed as spares to cut in to replace sets which have become foul.

Each filter box is usually 8 to 10 feet square and 2½ to 3 feet deep. The boxes are of substantial construction and are lead-covered inside and out. The boxes are under suction and the outer lead covering, which is backed up by the wooden box, has to withstand the suction pull. This is important, as these filters are not filled with a solid filling like coke which will hold the inner lead lining in place, and it is very difficult to hold light sheet lead from collapsing under suction unless backed solidly over its entire surface. At the top of the sides the lead is flared over so as to present a horizontal plane surface about 6 inches wide completely around the filter box.

The top is in one piece, lead-lined, and very heavily ribbed on the outside. Heavy timbers project out on the four corners, the projections being used as faces for raising the top by means of four hydraulic jacks. The lead lining of the top projects out about halfway on the horizontal lead flare of the sides. In order to render the box gas tight under suction it is only necessary to lower the cover into place, batten down the projecting edges of the lead cover against the lead below, and lute the junction with a plastic material such as a mixture of Portland cement and soft cup grease. The gas entrance is in the center of one side and near the top; the gas exit is in the center of the other side and near the bottom.

As previously stated, these filter boxes are usually arranged in straight-line sets of three in series. Each box contains an acid-proof brick or tile grill covering the bottom and occupying about 1 foot of the depth of the box. On top of this grill is spread a layer of straw. On top of the straw in the first box of the series is placed about 6 inches of fairly coarse pine sawdust, which is covered with coarse burlap to prevent its being blown away at the point of gas entrance immediately above it.

The second filter box also contains about 6 inches of sawdust, covered with a thin, hand-packed layer of finely fluffed, long-fiber asbestos, with burlap on top of the asbestos.

The third filter box is sometimes filled the same as the second box, but frequently the asbestos and part of the sawdust is replaced with a layer of mineral wool, which has the property of absorbing chlorine and acts as a safety factor in case any chlorine gets by the scrubbing system. These filters all operate with a downward gas flow and are very efficient when operated in this manner. Experiment has demonstrated that they are not effective when the direction of gas flow is reversed.

Each individual filter box is provided with a tapped drain through which the acid, if any is caught, drips into a catch tank or blow case. Under normal operation there is a very considerable and constant drip from the first filter box and occasionally there is a small drip from the second box, but there should never be any drip from the third and last filter.

On each filter box is a differential pressure gage to show the resistance to gas passage through the filtering medium, and continuous readings are made and recorded. The record shows quickly when a filter is becoming plugged; then the whole set is cut out and a fresh set cut in with no plant shutdown. The filling in the set which has been cut out is then removed and replaced with fresh material. Ordinarily the first filter has to be renewed every seven or eight days, the second filter every three or four weeks, and the final filter every six or eight months.

In a set of three filters built as above described each square foot of filtering surface can be safely figured as sufficient to filter 5 cubic feet of gas per minute without interposing serious resistance to the gas flow. As three filters are in series, this means that 15 cubic feet of gas per minute is actually being filtered through each square foot of each filter set.

DRYING THE SO_2 GASES.

The gases, after leaving the filters, go to a drying tower through a lead, steel, or even a wooden pipe. As there is no drop in temperature after leaving the filters there will be no further precipitation of sulphuric acid.

The drying tower (see fig. 24) is of cast iron, with closed top; a large flanged gas inlet enters the side of the tower close to the bottom at a downward angle so that none of the drying acid can run back into the gas-inlet pipe. The gas outlet is either in the top or in the side close to the top. A grill support of cast iron or acid-proof tile extends across the base of the tower above the top of the gas inlet; the incoming gases diffuse in the open space under the grill and rise through the tower. On top of this grill for a depth of several feet the tower is filled with special acid-proof distributing packing, or quartz pebbles 4 to 6 inches in diameter. Above this packing is a space of 8 to 12 inches and, if the tower be a side-outlet tower, the gas outlet is at this point. The tower wall is flanged at the top of this space, and on this flange rests another cast-iron section with upper and lower flange and with a solid bottom. In this bottom are bored countersunk holes; through each hole extends a porcelain tube of small bore and with a shoulder on one end, the shoulder fitting down into the countersink in the iron bottom and being cemented in with acid-proof cement. The porcelain tubes should be of ¼-inch to ⅜-inch bore and long enough to extend through the space below down into the quartz or tile tower filling. This upper section forms the acid distributing pan and is provided with a flanged acid inlet in the side. A flat cast-iron top covers the pan, being bolted to the top flange of the pan, and having a number of glass windows through which the operator may observe the acid in the pan below. These windows may be removed and the pan cleaned out or the porcelain tubes punched free from dirt if occasion arises. The acid for drying is a portion of the same acid that is used for absorbing the SO_3. Acid is delivered to the drier by the same pump that delivers acid to the absorber, and the discharge from the drier goes to the same coolers that also serve the absorber. This is described in connection with the absorption system. Tests of the gas after leaving the drier permit the operator to regulate the amount of acid circulation necessary to dry the gas.

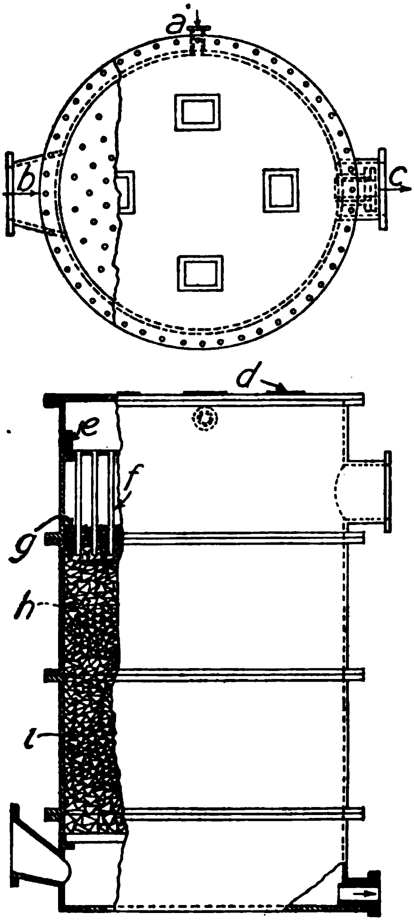


FIGURE 24.—Absorber and drier as used in the Badische system. *a*, Acid inlet; *b*, gas inlet; *c*, gas outlet; *d*, plate glass; *e*, pan; *f*, porcelain tubes; *g*, fine quartz; *h*, 3-inch quartz; *i*, 6-inch quartz.

GAS BLOWER.

The gas is handled by means of a positive blower such as the Connersville or Root types. This blower should be of ample size and is usually driven by means of a variable-speed motor. It is advisable to cover the whole interior surface of the blower with a coat of heavy cup grease and to renew this covering every six months or every year.

GAS PREHEATING.

The gases from the blower enter the preheating furnace and are heated to reaction temperature which, as has been previously stated, is usually about 420° C. Preheating is usually done in vertical cast-iron U tubes about 4 to 6 inches inside diameter by 7 to 8 feet long. (Fig. 25.) The wall thickness of the preheating tubes is ¾ to 1 inch. The gases are delivered from a header into a number of these tubes in parallel; the tubes are connected in series with a considerable number of similar U tubes by means of cast-iron return bands. Flanged connections between the tube ends and the return bands are inadvisable, because the steel bolts of the connection would expand, causing gas leakage. A very good type of connection consists of casting a shoulder about 1 inch wide around the outside of the open ends of the U tubes (or, if the return bend is on the bottom, around the outside of the return-bend open ends) about 2½ inches from the ends. A cast-iron ring about 1½ inches larger in internal diameter than the outside diameter of the tubes is then set on this shoulder. This ring is about ¾ inch thick and about 5 inches high, and when set on the shoulder projects about 2½ inches above the tube end. The open end of the return bend is then set down inside the ring and exactly on the tube end and the ¾-inch space between the inside of the ring, and the outer walls of the tube and return bend is tamped full of a mixture of sal ammoniac and fine iron filings. This results in the formation of a so-called "rust joint," which is very strong and does not leak when heated. If the tubes have to be replaced, the cast-iron rings may be easily broken with a hammer and a new ring used, as the cutting out of such a rust filling with a chisel is very difficult and almost sure to break the ring.

The tubes are usually arranged with about twice as many in series as there are in parallel, therefore the containing furnace is rectangular in shape. (See fig. 26.) The vertical plane through the centers of the two arms of the U tube is not parallel to the side wall of the furnace but is usually at an angle with it, which staggers each row and assists in obtaining much better convection in the hot furnace gases. These furnaces should be fired with coal, coke, gas, or fuel oil. The flow of gases to be preheated should be countercurrent to the direction of the hot combustion gases passing through the furnace and around the outside of the tubes. The first row of tubes next to the fire should be protected somewhat from the direct impact of the flames by a fire-brick grill work or similar installation. A heat transfer of 1.5 B. t. u. per square foot per degree Fahrenheit difference per hour or 7.3 kg-calories per square meter per degree centigrade difference) is all that can be safely figured on for the exposed area of

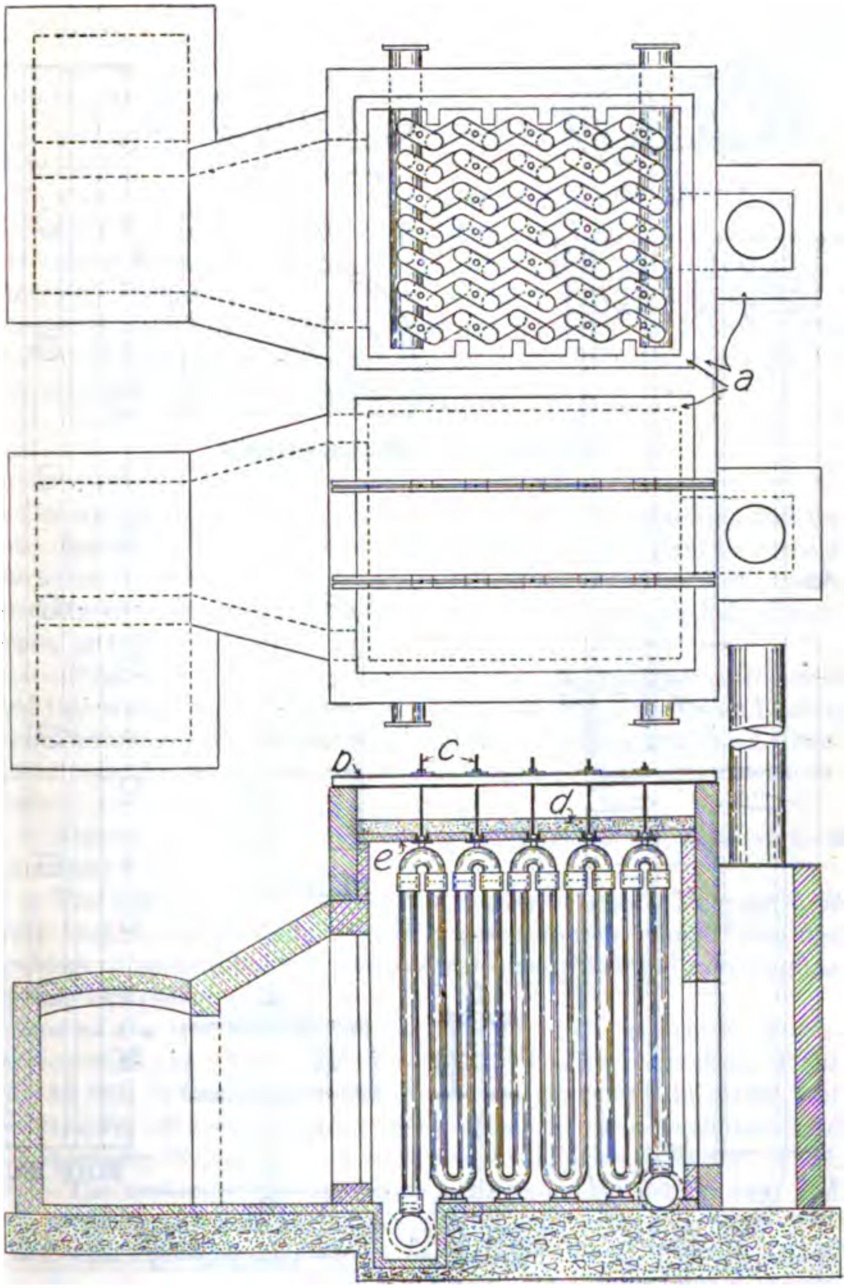
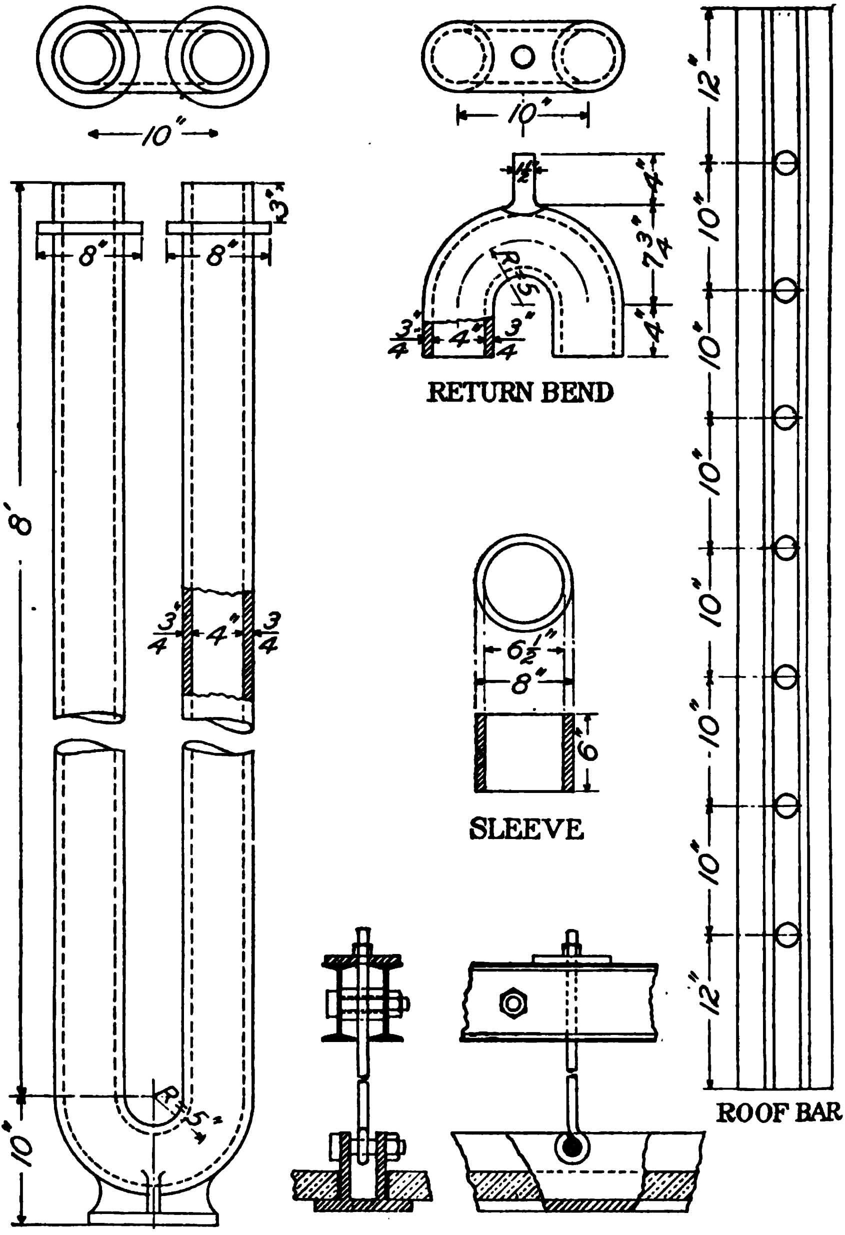


FIGURE 25.—Preheating furnace. Fire box shown is for crude-oil fuel. a, SO_2 gas inlet; b, six hundred 1¼-inch boiler tubes, 10 inches long; c, SO_2 gas outlet; d, SO_3 gas outlet; e, SO_3 gas outlet.



U-TUBE

RETURN BEND

SLEEVE

ROOF BAR

DETAIL OF ROOF SUPPORT

FIGURE 26.—Preheater details.

the preheating tubes. Ample tube surface should always be provided so that the tubes next to the fire will not have to be heated too high in order to obtain the required temperature of SO_2 gases, and also to utilize all the heat of the combustion gases. If properly designed and constructed, this type of preheating furnace will operate with very little trouble.

In a well-designed furnace, with gases averaging 6 per cent SO_2 by volume, the fuel consumption per net ton of H_2SO_4 produced varies between 550 pounds and 700 pounds of coal. With fuel oil a considerably higher efficiency may be obtained, and the amount of oil burned per net ton acid will vary from 1 barrel to 1⅓ barrels. The fuel burned for preheating per ton of acid produced will vary, of course, according to the SO_2 content of the gas.

HEAT TRANSFER SYSTEMS.

The oxidation of SO_2 is an extremely exothermic reaction, and the heat thus generated in the converter is frequently utilized to preheat partly or completely to the reaction temperature the cold SO_2 gases entering the converter. This procedure has several distinct advantages, as follows:

1. Part or all of the fuel required for gas preheating is saved and this results in an important saving, both of materials and labor.
2. The danger of overheating the gases in the converter and consequent poor conversion is greatly minimized or done away with entirely.
3. Repairs on the SO_2 preheating installation are reduced to a minimum.
4. The hot SO_3 gases leaving the converter lose a large part of their heat to the entering cold SO_2 gases, thereby simplifying the problem of cooling the SO_3 gases before absorption and reducing the cooling equipment required.

One of the best systems of heat transfer used, especially in connection with the "Badische" process, involves the oxidation of the SO_2 to SO_3 in two steps by means of two converters in series, and the transfer of heat generated by oxidation in these converters into the incoming SO_2 gas by means of two exchangers in series. (Fig. 27.) The exchangers resemble surface condensers set on end, and are vertical steel cylinders with closed ends, each end being provided with a flanged opening for gas inlet or outlet. The tube sheets and the tubes are of steel; the two flanged openings are on opposite sides of the cylinder and close to the tube sheets. The tubes vary from 1¼ inches to 2¼ inches in diameter, and from 10 feet to 17 feet long, according to different conditions and designs.

The cold SO_2 gases enter heat exchanger 1 and are partly preheated, after which they pass to exchanger 2 in series, where the gases are preheated to their highest temperature. The gases then enter converter 1 where the SO_2 is partly converted to SO_3 with liberation of heat and consequent rise in temperature. The mixture of hot SO_2 and SO_3 gases then goes to heat exchanger 2, where the gases give up some of their heat to the incoming SO_2 gases. From heat exchanger 2 they pass to converter 2, where the oxidation to SO_3 is completed and the temperature again rises. The hot SO_3 gases from converter 2 then pass through heat exchanger 1 and give up heat to the cold SO_2 gases entering this exchanger. The SO_3 gases then go to the final cooling and absorption system.

This conversion and transfer of heat in two stages permits much better control of temperature than is possible when conversion is accomplished in one stage, and also prevents overheating in the converters. By-passes provided around the units of the system may be used to attain closer regulation if necessary. The entire installation, including both converters and heat exchangers, is thoroughly insulated in order to conserve heat. With this type of heat-transfer system, no auxiliary preheating is necessary after the first preheating in order to start the reaction; therefore, the preheating furnace is cut out of the system by means of a by-pass.

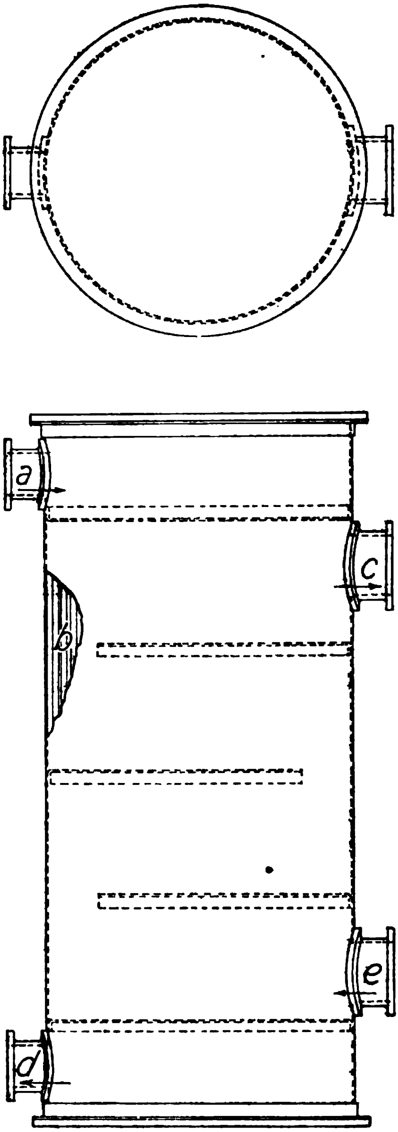


FIGURE 27.—Heat exchanger: *a*, SO_3 gas inlet; *b*, six hundred 1¼-inch boiler tubes 10 ft. long; *c*, SO_2 gas outlet; *d*, SO_3 gas outlet; *c*, SO_2 gas inlet.

Another general scheme of heat transfer, used especially in connection with the "Mannheim" system, involves utilizing the heat from the SO_3 gases coming from the platinum-catalyzer shaft to preheat partly the SO_2 gases entering the shaft. This is done in an exchanger similar to that described in connection with the "Badische" practice. The SO_2 gases after leaving this exchanger are still further preheated in a system of large horizontal cast-iron pipes installed immediately over the arches of the oxide-catalyzer shafts. Then the gases are brought to the requisite temperature for reaction in the platinum-catalyzer shaft in a cast-iron preheating furnace similar to that previously described. However, as only a comparatively small boost in temperature is required after the gases leave the last exchanger, this final preheating furnace is comparatively small and the fuel consumption very low.

Another type of heat transfer, used especially in connection with the "Grillo-Schroeder" system, utilizes the heat of reaction from the converter to preheat the incoming SO_2 gases by passing them through an annular space between the converter shell and an exterior shell large enough to leave space for such gas passage. The details of the construction and operation of this type of heat transfer will be discussed in connection with the converter.

In another method of partial preheating, utilized especially by the "Tentelew" process, heat from the reaction gases is radiated through a specially constructed cast-iron grill floor carrying the contact material up into the SO_2 gases entering above the grill floor. The details of the application of this method are discussed in connection with the converter as used in the "Tentelew" process, on page 181.

In general, the statement may be made that it is feasible to utilize the heat generated by the oxidation of SO_2 to SO_3 to preheat partly or entirely the incoming SO_2 gases to a temperature at which oxidation by means of the platinum catalyzer will take place; that the extent to which such preheating may be carried depends upon the design and mechanical construction of the heat-transferring apparatus, and also upon the SO_2 concentration in the gases, which is an important factor in determining the maximum temperature attainable by heat transference.

GAS CONVERTERS AND CATALYTIC MATERIAL.

CONVERTERS CONSTRUCTED ON HEAT-TRANSFER PRINCIPLE AND USING PLATINIZED MAGNESIUM SULPHATE.

Figure 28 shows a combined converter and heat exchanger.

The converter has an outer shell 77 feet 4 inches in diameter by 13 feet 8 inches high, and a concentric inner shell 6 feet 6 inches in diameter by 12 feet 8 inches high, which is closed at the bottom by a dished plate, and fitted with an outlet 10 inches in diameter.

The inner shell is arranged to receive four separate layers of contact mass, each weighing 2,500 pounds and spaced at intervals of

2 feet 11½ inches. The mass is carried on perforated plates three-sixteenths of an inch thick; 8½ inches below each plate is fixed a cast-iron circular baffle plate with an open 5-inch space between the edge of the plate and the walls of the inner shell. The baffles serve to divert the gases, after each contact, to the walls of the inner shell, thus insuring desirable heat exchange with the gases circulating between the outer and inner shells.

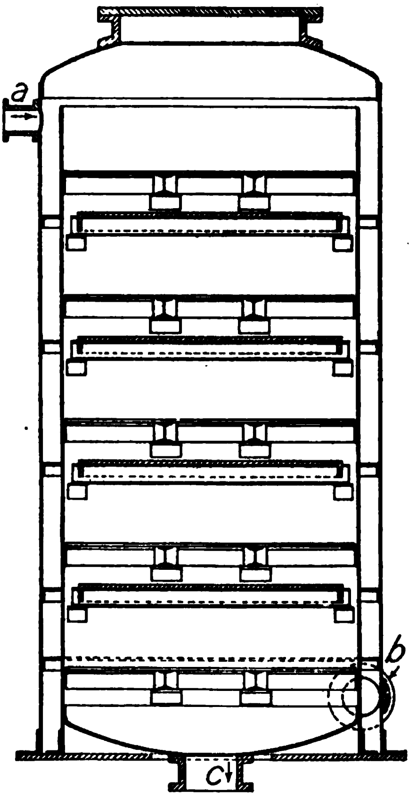


FIGURE 28.—Combined converter and heat exchanger used in "Grillo-Schroeder" system. *a*, SO_2 gases from preheater furnace, used in starting; *b*, SO_2 gases, cold; *c*, SO_3 gases.

The hot dry SO_2-air mixture enters the outer shell tangentially, at the base, through 10-inch diameter inlet pipes and is compelled, by baffles, to circulate spirally in the space between the two shells, being heated by the gases inside the inner shell. Having arrived at the top of the inner shell, the gases first pass downward through a layer of unplatinized material, and then in turn through the layers of platinized material on the perforated plates below, being heated by the heat of conversion as each contact mass is passed through, and cooled as the corresponding baffle plate compels circulation along the sides of the shell. Finally the gases pass through the 10-inch outlet to the heat exchangers as already described and thence to the SO_3 coolers.

CONVERSION.

The essential conditions for good conversion—that is, 96 to 97 per cent efficiency—are briefly as follows: (*a*) Careful operation of the burners and the supplementary air inlet in order to obtain a steady composition of the gases entering the converters; (*b*) efficiency in the purification system; (*c*) the maintenance of low temperatures in the converters, no temperature to exceed 480° C.; (*d*) the exit temperature of the gases leaving the converters should be about 410° C.; (*e*) all temperatures should be kept steady.

The temperature at which conversion commences is a function of the velocity of the gases, as is shown in the table following:

Relation of conversion temperature to velocity of gases.

Sulphur charge, pounds.	Velocity of gases, feet per second.	Temperature at which conversion of SO_2 to SO_3 starts, °C.
35	4.0	360–370
70	8.0	370–380
80	9.2	390–400

The converter temperatures must be carefully watched so that a uniform distribution of load is obtained, the maximum temperature at any point being 480° C. and the exit temperature within 10° of 410° C.

Temporary "poisoning" of the contact mass—such as is due to halogens—has the same effect as increasing the velocity of the gases, in that a higher temperature is required to start conversion. If the temperature can be raised quickly, temporary poisoning can be ovecome, otherwise the poison must be removed by roasting the mass for about four hours with air at 450° C.

CONVERTERS CONSTRUCTED WITHOUT HEAT-TRANSFER PRINCIPLE.

A type of converter radically different from the one previously described in connection with the "Grillo-Schroeder" system is frequently used where the design calls for the preheating of the gas entirely by means of externally fired furnaces, or a separate heat exchanger, such as described in connection with the "Badische" system. This converter (fig. 29) consists of a cast-iron shell usually about 6 feet in diameter and 10 to 12 feet high, with a flanged gas inlet at the base and a flanged gas outlet in the dome cover at the top. Ribs are cast around the inside of this shell, which serve as bearings for the cast-iron grill floors or shelves. These shelves are usually spaced about 18 inches or 2 feet apart, and there are generally five shelves to each converter tube. About 1,500 pounds net dry weight of magnesium sulphate contact-material is placed upon each shelf, the coarsest material being spread over the shelf first, then a layer of the medium-sized material, and finally a top layer of smaller sized material. Pyrometer couples are placed over the shelves to indicate the rise in temperature taking place within, and the whole converter tube is insulated against too great heat loss, the amount of this insulation being determined by observation of temperature conditions after the unit is in use. The SO_2 gas enters directly from the preheating furnace or from the heat exchanger, if one is used, into the base of the converter, passes upward through the catalytic material and is oxidized to SO_3, the gases finally passing out at the top. There are usually two converters of this size, in parallel, to each unit, having a capacity of 18 to 20 tons H_2SO_4 per 24 hours, but some designers prefer to use smaller tubes (5 feet in diameter) and use four tubes to a unit.

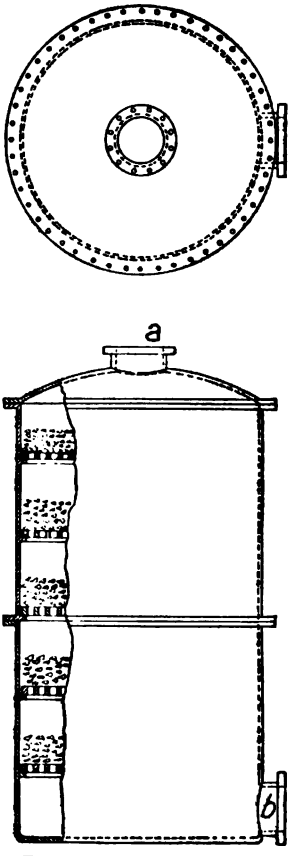


FIGURE 29.—Contact chamber as used in the Grillo-Schroeder system. *a*, Gas inlet; *b*, gas outlet.

PLATINUM CATALYZER WITH MAGNESIUM SULPHATE CARRIER.

The contact material used in the so-called "Grillo-Schroeder" system is platinum catalyzer with magnesium sulphate carrier. Magnesium sulphate, when properly calcined, has the property of forming a hard but very porous mass resembling pumice stone but more porous.

One method of preparing this type of contact material is as follows:

METHOD OF PREPARATION.

The magnesium sulphate crystals are first calcined in flat iron pans, 5 feet by 2 feet 9 inches by 3 inches deep, giving a cake, after baking, containing about 14 per cent moisture. This is passed through a Sturtevant crusher, set for the finest product, and then ground to dust (first dust) in a "devil" disintegrator, mixed with water and rebaked or recalcined in a hot pan of the same dimensions as the first.

The second cake is passed through a Sturtevant crusher, set for the coarsest product, and then through a rotating trommel screen, and graded as follows: (*a*) Dust; (*b*) dust under one-half inch; (*c*) "mass," from three-fourths inch to one-half inch.

The "mass" (grade *c*) is then stored, ready for platinizing, while grades *a* and *b* are passed through the disintegrator for the formation of dust (second dust) for rebaking.

The finished mass contains slightly more than 9 per cent water, and should be hard, resembling pumice stone in its tenacity, and having a vitreous fracture. A good test for the hardness of the mass is obtained by rubbing two pieces together. Good mass will resist the friction and pressure, only giving a little surface dust and tending to become polished. It is extremely important that the mass should not be friable, as disintegration would result when the mass is introduced into the converter, and probably lead to loss of platinum, as well as causing increased resistance to the passage of the gases through the converter.

PRODUCTION OF THE FIRST CAKE.

The essentials for the production of a satisfactory first cake are as follows:

(*a*) The purest crystals only should be used, otherwise a porous cake will be produced.

(*b*) As soon as the contents of the pan have become solid, it must be frequently rubbed over to insure a compact mass.

(*c*) The normal time of baking is about seven hours, but prolonged heating does not affect the first cake adversely.

(*d*) The normal charge per pan is 200 pounds.

(*e*) The first dust must be as fine as possible, smooth to the touch, and free from unreduced grits.

PRODUCTION OF SECOND CAKE.

The essentials for the production of a satisfactory second cake are as follows:

(*a*) This should be made from equal proportions of the first and second dust.

(*b*) The charge per pan equals 140 pounds of dust, mixed into a thick cream with about 6½ gallons of water. This gives a cake 1.1 inches to 1.3 inches thick.

(*c*) The mixing, with rakes, must be very thorough.

(*d*) The initial temperature of the pan must be such as to cause the mixture to boil freely, but not vigorously. If this condition is obtained and the mixing is carried out properly, the cake dries quickly without "explosions."

(*e*) The cake must be evenly dried and baked, and should be tested for hardness before removal from the pan.

(*f*) Each cake should be tested individually after removal and cooling and, if not a good sample, reduced to second dust for recaking.

(*g*) The cake must be absolutely cold before crushing, if the maximum yield of correct size is to be obtained.

(*h*) The mass for platinizing should not be riddled for two or three days, as a good sample of cake becomes harder on storage. Bad mass, on the contrary, deteriorates.

PLATINIZING.

The mass is first carefully riddled over a ¾-inch mesh screen to free it from dust. It is then placed in pottery trays on rubber mats in lots of 200 pounds; this quantity, with a moisture content of 9 to 10 per cent, is equivalent to 180 pounds of $MgSO_4$. The amount of platinum chloride required to give an 0.3 per cent platinum content is then weighed out and dissolved in about 2¾ gallons of water. This is evenly spread over the mass, which is continually raked over to expose a fresh surface. A glass spray is used, and the head to produce spraying is obtained by raising the solution container to the necessary height by means of pulleys.

Heat is evolved during spraying and, after all the solution has been disposed of, the mass is allowed to remain for at least eight hours before being removed to the converters.

Another method of preparing the platinized magnesium sulphate mass, somewhat simpler and giving a more uniform platinum distribution but entailing a larger loss in platinum unless great care is used, is as follows:

The magnesium sulphate crystals are spread out in a steel pan about 4 feet wide by 8 feet long by 10 inches deep—about 1,000 pounds of the crystals being used for each pan charge. A very dilute solution of platinic chloride is then sprayed evenly over the whole exposed surface until the desired amount of platinum has been added. When this has soaked in, the moist mass of crystals is thoroughly mixed by means of shovels. The impregnated mass of crystals is then shoveled onto the tile hearth of a furnace. This furnace (fig. 30) is constructed so that the products of combustion pass under the tile hearth, then up over a bridge wall, back over the mass of crystals on the hearth, and, finally, out of a stack. The hearth is usually about 4 feet wide by 10 feet long. In one side three wide doors are provided, through which the material is shoveled in and raked out and through which the charge is spudded and rabbled. The base of these doors is on the same level as the hearth; a shelf about 1 foot wide extends along the outside of the furnace, also at the hearth level.

Every endeavor is made to have a neutral or reducing flame in firing the furnace, especially on the first cooking of the platinized crystals.

The tile hearth should be hot (300° to 400° C.) when the crystals are shoveled in. The door exits should be dammed to a depth of 6 or 8 inches with fine, previously calcined material and the doors shut at once in order to keep out all excess oxygen.

The magnesium-sulphate crystals melt in their own water of crystallization, and as this water is evaporated off the whole mass swells

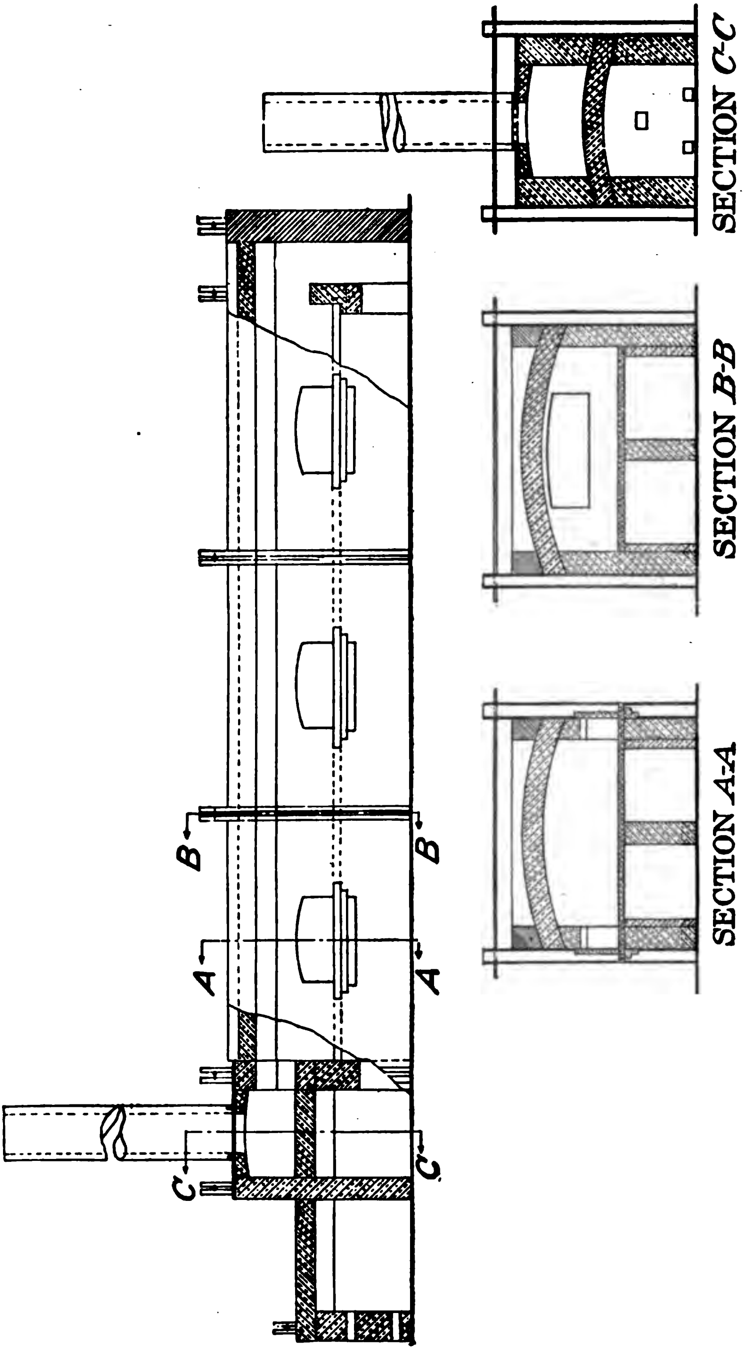


FIGURE 80.—Furnace for calcining magnesium sulphate contact material.

up in a porous, moist cake. When this condition is reached a strong crust has been formed next to the hearth, and at this point the cake should be broken up and turned over by means of a wide, flat-nosed steel spud driven in between the tile hearth and the hard crust on the underside of the cake. The large chunks are then broken up and turned over from time to time until all the moisture is evaporated except the last molecule of the water of crystallization. The cake is then raked out and cooled. After cooling it is ground through close-set fluted rolls or in a grinder. Care must be taken to avoid dust loss. The ground product is then remixed with enough water to make a thick paste and allowed to set until it solidifies. It is then reroasted in the same manner as before, except that the hearth may be a little hotter to start with and such great care need not be taken to maintain reducing conditions.

The cake from the second roasting is run through a pair of fluted rolls set about three-fourths of an inch or 1 inch apart. The crushed product is then sized through a set of shaking slotted screens. Four sizes of final product are obtained: (1) Through ¼-inch by ⅝-inch slots—fines which are crushed and refurnaced; (2) through ½-inch by ¾-inch slots, on ¼-inch by ⅝-inch slots; (3) through ¾-inch by 1¼-inch slots on ½-inch by ¾-inch slots; (4) through 1-inch by 1½-inch slots on ¾-inch by 1¼-inch slots.

There is no oversize, as it is spalled on the top screen until it passes through the 1-inch by 1½-inch slots. The finished material is put into closed bins, each size being in a separate bin, and is kept there until it is placed in the converter.

AMOUNT OF CATALYTIC MATERIAL REQUIRED.

A wide divergence is found in different plants as to the quantity of platinum required to oxidize a given quantity of SO_2 gas and also the quantity of carrier necessary for such platinum, or in other words, the platinum concentration of the contact mass. As a matter of fact, there are many features which radically influence capacity. Principal among these may be mentioned:

1. Absolute cleanliness of the gas, not only from mechanical impurities, but also from gaseous impurities, especially the halogens, AsH_3, and similar gases. The presence of any of these impurities will interfere with conversion and cut down the capacity decidedly.

2. Porosity of platinum carrier or actual surface exposure for a given weight of platinum used.

3. Concentration of SO_2 in the gases and efficiency of conversion desired. A large increase in the amount of SO_2 oxidized by a given weight of platinum is possible if the cost of sulphur dioxide is not a large factor, and high conversion and consequent high yield from sulphur is not an essential.

4. Fairly accurate control of heat conditions within the converter in order to avoid too high temperatures with consequent inhibition of the oxidation or reversal of the reaction.

In general, it may be stated that, with very efficient operation, using absolutely clean sulphur dioxide gas at a concentration of 6 to 7 per cent SO_2 along with the carefully prepared, very porous, magnesium sulphate contact material, and with proper control of temperatures the average practice in the United States uses 14 to 16 Troy ounces of platinum for each ton of H_2SO_4 (monohydrate basis) daily production. Plants are now in operation using only 12 ounces of platinum per ton of H_2SO_4 production.

As regards the platinum concentration in the contact material, this varies from 0.1 to 0.3 per cent by weight, but the evidence is not conclusive that either of these extremes is preferable, as the porosity and consequent surface exposure of the platinum carrier varies greatly. It has frequently been found advisable to fill the converter with contact material of several different platinum contents, using material of 0.1 per cent content for the initial oxidation and finishing with material of considerably higher platinum content.

TREATMENT OF FOUL MAGNESIUM-SULPHATE CONTACT MASS TO REVIVE ITS ACTIVITY.

If the loss of activity is due to temporary "poisoning," such as is caused by the presence of halogens, the cause of the trouble—that is to say, the poisonous gases—should be first corrected, after which raising the temperature of the incoming gases will frequently increase the conversion to its original efficiency. If this be done the temperature must be lowered very slowly to its original point, and sometimes must be maintained at 5° or 10° C. higher than the original point.

If the poisoning is more serious, caused by traces of arsenic or other similar compounds, this condition can be largely overcome by shutting down the converter while hot and immediately filling it with chlorine gas, blinding the inlet and outlet of the converter, and permitting the contact mass to stand, heated, in the atmosphere of chlorine for about 24 hours, when the converter should be again cut into the system and brought up to the required temperature by passing hot SO_2 gas through it. Within 18 to 24 hours after the SO_2 gas is introduced good conversion is usually obtained; if the poisoning has not been too serious, the conversion efficiency will be nearly that of the new, clean material.

If the poisoning is very serious, caused by large amounts of arsenic, SiF_4, or other impurities, the contact material must be taken out of the converter, treated, and reroasted. The method of treatment is as follows:

Into a rectangular wooden box, about 4 feet wide by 10 feet long by 12 to 14 inches deep, should be placed enough pure water to add about 5 molecules of water to the amount of foul magnesium sulphate material to be treated. Into this water should be dumped about 25 gallons of strong nitric acid and 12½ gallons of commercial muriatic acid. One thousand to 1,200 pounds of the foul contact material should be then gradually dumped into the weak acid mixture. This must be done carefully, as a great amount of heat is generated and the solution is liable to foam and boil over, causing a heavy loss in platinum. Generally about half of the charge of foul material is added and stirred thoroughly until the reaction has subsided, after which the balance of the material is added in smaller lots, the mixture being stirred after each addition until the reaction has subsided.

The dehydrated magnesium sulphate goes into solution with difficulty, but the temperature of the solution rises very considerably and by suitable and continous stirring all of the magnesium sulphate may be dissolved. The addition of 25 to 50 pounds of cane sugar to the batch is advisable, as this sugar not only assists in the subsequent "setting" of the batch but also acts as a reducing agent to facilitate reduction of platinum in the subsequent calcining. After the charge is completely dissolved it should be allowed to stand until the whole mass has solidified, which usually takes about 24 hours. It is then broken up, removed from the box, and roasted, screened, and sized in exactly the same manner as with new material, except that complete grinding of the first roasted product is unnecessary.

A simple method of testing contact material to determine whether it is active is to hold a small piece with a pair of tongs in the flame of an ordinary Bunsen burner until it is incandescent; then pinch the gas tube of the burner putting out the flame, until no incandescence is visible in the piece of contact material; release the tube, allowing the gas to again come from the burner, and if the contact material is active the gas will ignite. This is a rough method, but quick, and gives an extremely good index as to the activity of the mass.

PLATINUM CATALYZER WITH ASBESTOS FIBER CARRIER.

The type of contact material used in the "Badische" process is platinum catalyzer with asbestos fiber carrier. The material consists of carefully selected long-fiber asbestos treated in somewhat the same manner as is described later in the discussion of the treatment of the asbestos used to make the mats in the "Mannheim" process. After the asbestos fiber has been treated and dried it is immersed in a bath of platinic chloride; the impregnated asbestos is permitted to drain, dried, and fluffed. This asbestos is then placed upon grilled shelves in cast-iron converters, so connected that the gas flow is downward, in order to keep the light, fluffy material in place and prevent channeling. Usually two converters are used to each unit in connection with two external tubular heat exchangers, such as have been previously described. The first converter is considerably larger than the second converter, and most of the conversion takes place in the former. The asbestos in the second converter usually carries a higher platinum content than that in the first converter, but there is less material used. This contact material gives the largest surface in proportion to the platinum used of any of the various catalytic materials, and for that reason less platinum is required per ton of acid capacity than is required in the best type of magnesium sulphate-platinum contact material. Very good results are obtained on a basis of 13 to 14 Troy ounces of platinum per ton daily capacity of monohydrate sulphuric acid.

The success of this form of catalytic material depends upon the absolute cleanliness of the gas from mechanical impurities, acid mist, etc. Temporary "poisoning" by halogens may be overcome in the same manner as with other materials, but retreatment of this material when it is badly fouled with arsenic or other similar "poisons" is practically impossible. If this contingency arises, it is necessary to replace with new contact material and recover the platinum from the old material. The asbestos fibers, being extremely fragile, will not withstand anything but the most careful handling, and rapidly lose their strength and stability when exposed to the high heat inside of the converters.

CONVERSION SYSTEM OF THE "TENTELEW" PROCESS.

In the "Tentelew" process the preheating of the incoming SO_2 gases and the maintaining of uniform temperature within the converter are largely accomplished by an entirely different method than is employed in any of the other processes—namely by heat radiation instead of by heat transfer. The cold incoming SO_2 gases first pass through a single vertical tubular heat exchanger (fig. 31), constructed after the same design as has been previously mentioned in connection with the "Badische" process, but the increase in temperature is much less than in the "Badische" or "Grillo-Schroeder" heat transfers. The partly preheated gases, after leaving the heat exchanger, enter the top of the converter (fig. 32). The converter is constructed so as to utilize heat by radiation and also to take advantage of the fact that with gases moving at very slow speed the platinum catalyzer becomes active at a much lower temperature than is ordinarily the case. The top part of the converter is, relatively speaking, very large, hence the velocity of the entering gases is greatly reduced. This part of the converter, with very large cross-section, is termed the "equalizing space"; at the bottom of this space is a specially constructed cast-iron grill or sieve-plate. This sieve-plate is provided with a large number of cast-iron "pyramids" projecting upward. The principal portion of the contact mass, which is platinized asbestos, is spread on this sieve-plate but

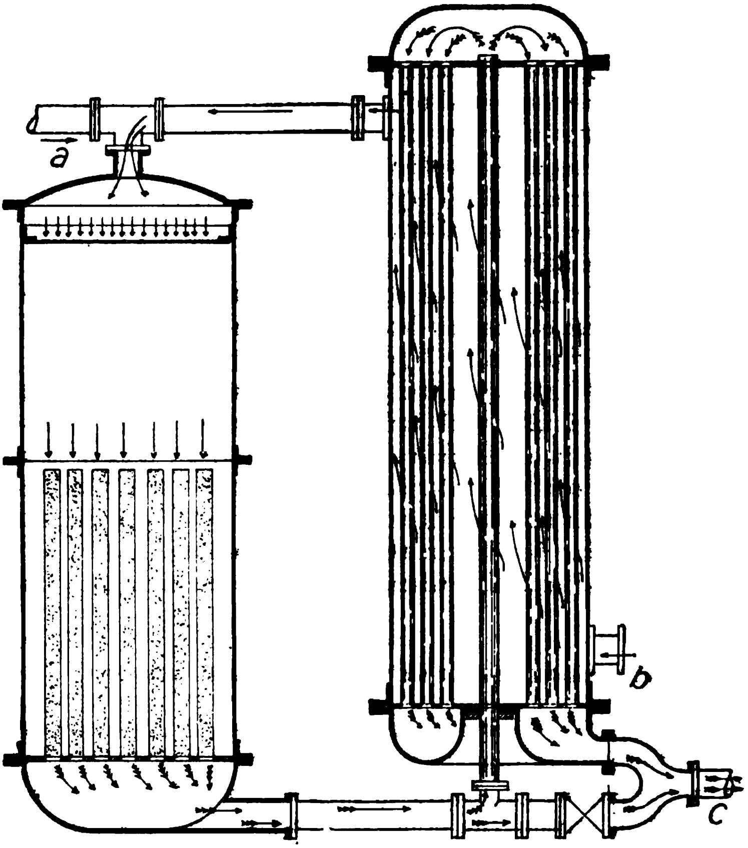


FIGURE 31.—Heat exchanger and converter, "Tentelew" system. *a*, inlet used in starting; *b*, inlet to preheater; *c*, outlet.

does not reach completely to the top of the pyramids. As this upper portion of the contact mass that comes into contact with the fresh gases has a large surface exposure it radiates a considerable amount of heat into the equalizing space above it. Radiation is also greatly assisted by the cast-iron pyramids conducting heat from their bases, which are surrounded by active contact mass, to their points, which protrude above the mass and into the gases entering it. By this means not only are the gases entering the contact mass preheated to a temperature at which maximum oxidation takes place, but this transfer of heat also serves to cool the temperature of the gases in the zone of reaction itself, and thus prevents serious overheating of the platinum catalyzer. After passing through the sieve-plate the gases enter a part of the chamber which has a much smaller cross section, this part containing the rest of the contact material and being heavily insulated to prevent loss of heat. The final oxidation takes place here and the hot SO_3 gases pass out at the bottom and into the top of the tubular heat exchanger previously mentioned, preheating the entering SO_2 gases to a temperature sufficiently high to start the reaction when reinforced by the additional heat radiated from the sieve-plate. An external preheating furnace with by-pass connections is used to start the process, then this furnace is cut out and the operation proceeds as described.

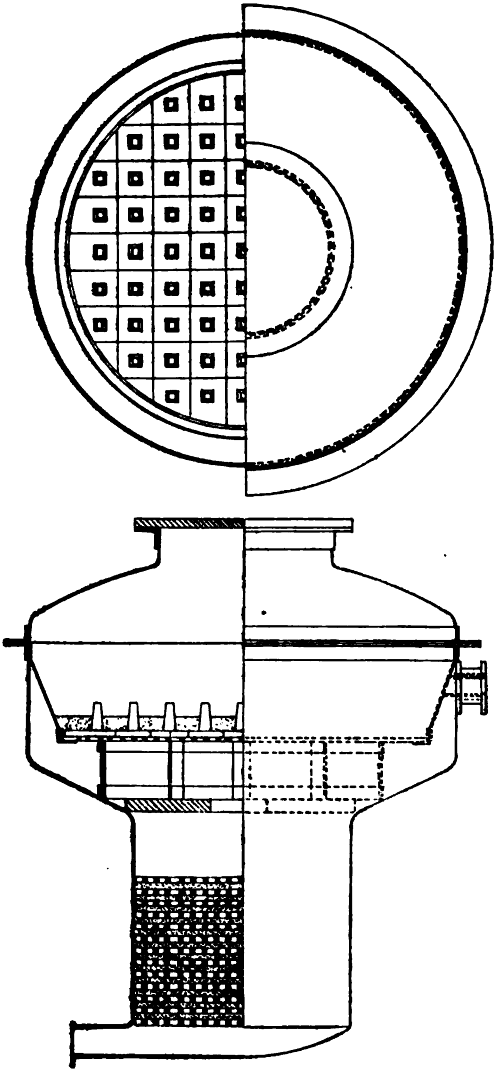


FIGURE 32.—Combination converter and heat exchanger, "Tentelew" system.

COMBINED OXIDE AND PLATINUM SYSTEM.

Some systems, especially the "Mannheim," economize in the use of platinum by utilizing hot ferric oxide to oxidize part of the SO_2, the oxidation being completed by means of platinum. The ferric oxide is a product of the roasting of coarse (2-inch to 2½-inch) pyrite in lump burners. This product is screened after being discharged from the lump burners and the coarse oxide is used in the oxide shafts.

OXIDE SHAFTS.

These shafts are usually square, steel, brick-lined chambers measuring 20 to 25 square feet in cross section and 10 to 12 feet high. They are filled with the burned, screened, iron-oxide lumps, 2 inches or larger in size. A certain amount of fresh oxide lumps is added to the top of the shaft each day and a corresponding amount drawn from the bottom. The hot SO_2 gas mixture from the ore or sulphur burners enters the base of the oxide shaft and passes up through the oxide filling. About 40 to 50 per cent of the SO_2 is usually converted to SO_3 in these towers. The temperature of the ferric oxide contact mass should not be below 600° C., otherwise SO_3 is lost, as it combines with ferric oxide to form ferrous sulphate. The mixed SO_2 and SO_3 gases are cooled and the SO_3 absorbed in strong sulphuric acid; the residual gas is filtered and cleaned, passed through the heat transfers following the platinum shaft and above the oxide shafts, then through a preheating furnace, and, finally, through the platinum shaft.

PLATINUM SHAFTS.

There is usually one platinum shaft to each two oxide shafts. Each shaft usually consists of three ovens about 4 feet square by 1 foot deep. In each oven are placed several platinum mats supported between wire gauze. The mats are made of about ¾-inch asbestos rope woven with the strands about one-eighth inch apart in the clear. From 20 grams to 25 grams of platinum are deposited on each mat. The following is a description of the Mannheim mat platinizing and mounting process, which is typical of the usual practice:

METHOD OF PLATINIZING AND MOUNTING THE MATS.

To 40 liters of pure distilled water is added 1 liter of a solution of sodium carbonate (containing three-eighths of a pound of Na_2CO_3). The liquid is heated by means of steam at about 20-pound pressure until it boils vigorously; then the asbestos mat, which has been shaken to remove loose particles, is placed in the bath. One liter of sodium-acetate solution (containing 1 pound of pure $HCOONa$) is added, and, after bringing the liquid again to the boiling point, 400 cubic centimeters of 10 per cent platinic chloride ($PtCl_4$) solution (previously made alkaline with sodium-carbonate solution) is poured in slowly. The mat is moved up and down through the solution three or four times, and then a cover is placed on the bath and the liquid allowed to boil for a quarter of an hour. The mat is then reversed and a further 200 cubic centimeters of platinic chloride ($PtCl_4$) solution added, after which the solution is kept at the boiling point until the whole of the platinum has been deposited on the mat. This takes 10 to 20 minutes, and is shown by the complete clearing of the liquid.

The mat is then reversed and placed in another bath containing 50 liters of cold water. When 10 mats have stood in this bath 4 to 6 hours, the water is run off and replaced by 60 liters of a 10 per cent H_2SO_4 wash at a temperature of 35° to 40° C. This first acid wash lasts about 18 hours, and is followed by a second 10 per cent H_2SO_4 wash, lasting the same length of time and at the same temperature.

The acid treatment is followed by two hot-water washings, each lasting 10 to 12 hours, which remove the soluble sulphates formed during the treatment with H_2SO_4.

The mats are then placed on wooden racks in a hot-air oven, at a temperature of about 60° C., to drain and dry. After drying, they are ready to be mounted for baking in the platinum shaft. The mats are mounted as follows: (*a*) Heavy iron frame with handle, (*b*) iron-wire grid, (*c*) platinized mat, (*d*) light iron frame, and so on until 10 mats are in position.

The complete element is now placed in one of the sections of the platinum shaft and baked for 5 to 6 hours at a temperature of 450° C. After baking, the element is dismantled and the mats placed carefully (as they are very brittle) in a tank filled with cold distilled water, where they are left for about 2 hours, until they are quite pliable. The water is then run off and a 10 per cent solution of hydrochloric acid is added and kept, by means of steam, at about 50° C. for 12 hours.

After this follow two hot-water washings, each lasting 6 hours, and finally one cold-water wash lasting the same length of time.

The mats are then drained on racks and sprinkled with cold distilled water until the water draining from the mats shows no trace of either chloride or sulphate. The mats are then drained and dried and are ready for use.

It is important to test the distilled water systematically, as the presence of any impurity affects the deposition and adherence of the black platinum on the asbestos.

RE-TREATMENT OF MATS FOR REMOVAL OF ARSENIC.

After the removal of an element from the plant, samples are taken from the third and sixth mats, and the percentage of arsenic determined. The mats are then given a 5 per cent hydrochloric-acid wash at 60° C. for 6 hours. They are then washed twice in hot water and finally drained and sprayed with distilled water till the water issuing from the mats shows no trace of sulphate or chloride. The mats are then dried and samples again taken to determine the arsenic content in the re-treated mat.

The two-stage system of oxidation with ferric oxide and platinum, of the Mannheim process, is considerably more expensive both in installation and operation than any of the "straight" platinum oxidation systems. The multiplicity of heat transfer systems, SO_3 absorption systems, oxide and platinum converter units, etc., add greatly to the initial installation cost and complicate the plant operations, repairs are a heavy expense item, and the only advantage is a saving for platinum in the original installation. An advantage of the ferric oxide contact shaft is that it removes the arsenic effectively and thus protects the platinum mass.

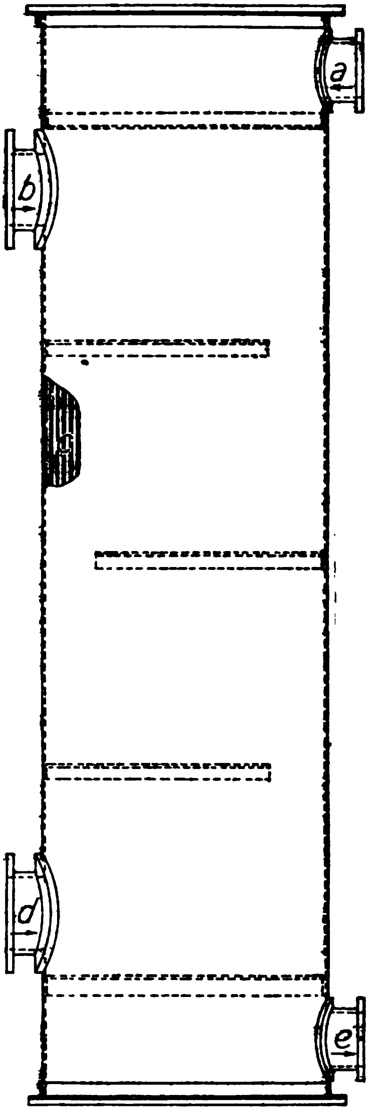


FIGURE 33.—Natural-draft air cooler for cooling SO_3 gases after leaving the converter. *a*, SO_3 gas inlet; *b*, air inlet; *c*, six hundred boiler tubes, 1½ inch by 18 feet; *d*, air inlet; *e*, SO_3 gas outlet.

COOLING THE SO_3 GASES.

The SO_3 gases, after leaving the converter or heat transfer, are passed through a cooling system before they enter either the oleum towers or the final absorbing tower. This cooling system usually consists of simply steel or cast-iron pipe, air cooled, of sufficient size to carry the gases without frictional resistance and long enough to cool the gases by radiation to a temperature of 50° C., or preferable lower (fig. 32).

If the SO_2 gases, before conversion, have been thoroughly dried with strong sulphuric acid, there will be no acid condensation in the cooling system following the converters, and steel piping may be used. This pipe may also be water sprayed if desired. If the gases, however, contain a considerable amount of H_2SO_4 after conversion, this acid will precipitate out as the gas cools, and cast-iron pipes must be used for the first (hot) portion of the cooling installation, as hot, strong H_2SO_4 attacks steel. Steel heat transfers can not be successfully used unless the gases are thoroughly dried.

Cast-iron pipe cracks badly, however, even when cast without chaplets, and, from every consideration, it is advisable to dry thoroughly the SO_2 gases before conversion.

FINAL ABSORPTION SYSTEM.

The final tower in which the SO_3 is absorbed in sulphuric acid is constructed exactly like the tower for drying the SO_2 gases, previously described. The acid delivered to the distributing pan at the top of the tower should be in such quantity relative to the SO_3 to be absorbed that the acid will be strengthened from 97 or 97½ per cent entering strength to 99 or 99½ per cent exit strength in its passage through the absorbing tower and at the same time absorb all the SO_3.

The acid, after leaving the base of the absorbing tower, passes through a cast-iron pipe to an acid cooler situated off to one side and at a lower level. In this pipe, and close to the tower, is provided an overflow through which all the acid not returned from the cooler to the absorbing tower passes. This acid is the plant product and goes to storage or direct to the oleum system. The strength of such acid is usually about 99 or 99½ per cent.

Between this overflow and the cooler is situated the weak acid or water inlet where the requisite proportion of water is added to reduce the acid to about 97½ per cent strength. At this point, also, the acid returning from the SO_2 drier enters.

The adding of the weak acid, the drying of the SO_2 gases in the drying tower, and the absorption of the SO_3 in the absorbing tower all tend to raise the temperature of the acid, and this temperature must be reduced by cooling.

The acid-cooling system is of cast iron and may be simply large pipes, water sprayed, or, more preferably, a manifold cooler built of sections of standard pipe and fittings in such a manner that the acid to be cooled passes between an outer and inner pipe, the inner pipe being water cooled. (See fig. 34.) Provision should be made for draining and cleaning the cooler occasionally, as sulphates tend to accumulate.

From the cooler the acid is delivered to the pans of the absorbing and drying towers by means of a cast-iron centrifugal pump. This pump should be a closed runner pump, designed in such a manner that the stuffing box is on the suction side. A vertical pump with long shaft, acid inlet around the shaft above the runner, and long pipe section between the acid inlet and the stuffing box above works very well. If well designed and constructed, such a pump will run for a year or more without repairs.

OLEUM SYSTEM.

In the manufacture of oleum (fuming sulphuric acid) part or all of the strong acid overflowing from the absorbing tower is passed down through towers against an upcoming stream of SO_3 gases.

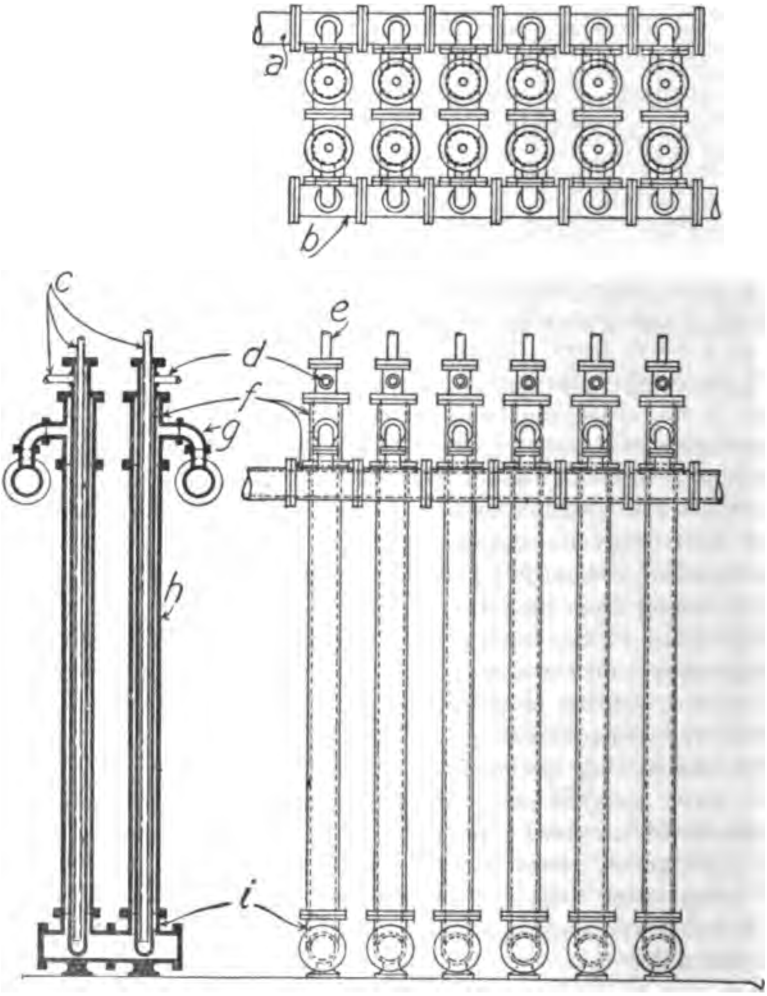


FIGURE 34.—Cooler for strong acid. *a*, Acid inlet manifold from absorber; *b*, acid outlet manifold; *c*, standard 1-inch pipe; *d*, cooling water outlet; *e*, cooling water inlet; *f*, standard tee, 6 inches by 6 inches by 12 inches; *g*, standard 2-inch ell; *h*, standard 6-inch cast-iron pipe; *i*, standard 6-inch base tees.

These towers may be 15 to 30 inches inside diameter and 10 to 25 feet high, depending on the capacity desired and the strength of the SO_3 gases. Hot oleum attacks steel and also tends to crack cast iron. An excellent type of construction comprises an outer steel shell with cast-iron base and top. This steel shell is lined with thin cast-iron liner rings or sections, the small space between the rings and the outer steel wall being filled in with a semifluid acid-proof cement, such as sodium silicate and silex, which hardens under the action of the acid.

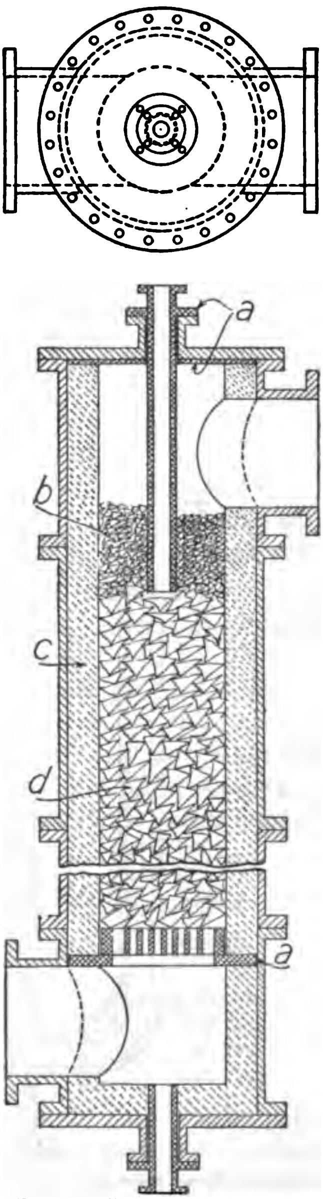


FIGURE 35.—Oleum tower. a, Tantiron; b, 3-inch quartz; c, duro brick laid with duro cement; d, 4-inch quartz.

The towers are filled with large quartz pebbles or special acid-proof filling in order to provide a large absorption surface. As the absorption of SO_3 by sulphuric acid generates heat, a small acid cooler should follow each oleum tower if these towers are arranged in series. Cast-iron or steel tower shells lined with acid-proof brick (fig. 35) are also used successfully, but have the disadvantage of poor heat radiation.

There are several methods of arranging and operating these towers.

Several towers may be installed in parallel, all supplied with SO_3 gases from a common header and the amount of gases entering each tower from the header being controlled by a valve. The strong acid from storage is admitted into the top of each tower; the oleum discharges at the bottom of each tower through a hydrometer boot. In this way the strength of the oleum produced in each tower may be closely governed by regulating the gas and acid flow. The gases and SO_3 from the oleum tower go directly to the 97½ or 98 per cent acid towers for complete recovery of the SO_3.

Another method is to have two or more oleum towers in series directly in the gas line leading from the converters or heat transfers to the absorbing tower. In this installation all the SO_3 gas passes through the oleum towers in series. The strong sulphuric acid passes down through the towers in series, and acid coolers (fig. 36) are installed between each two oleum towers. In this type of installation the strength of the oleum is regulated solely by control of the amount of acid absorbed and the temperatures, as all the gas is passing through the towers at all times. If the oleum produced is too strong, it is weakened by admitting weaker acid after the last absorption of SO_3 has taken place.

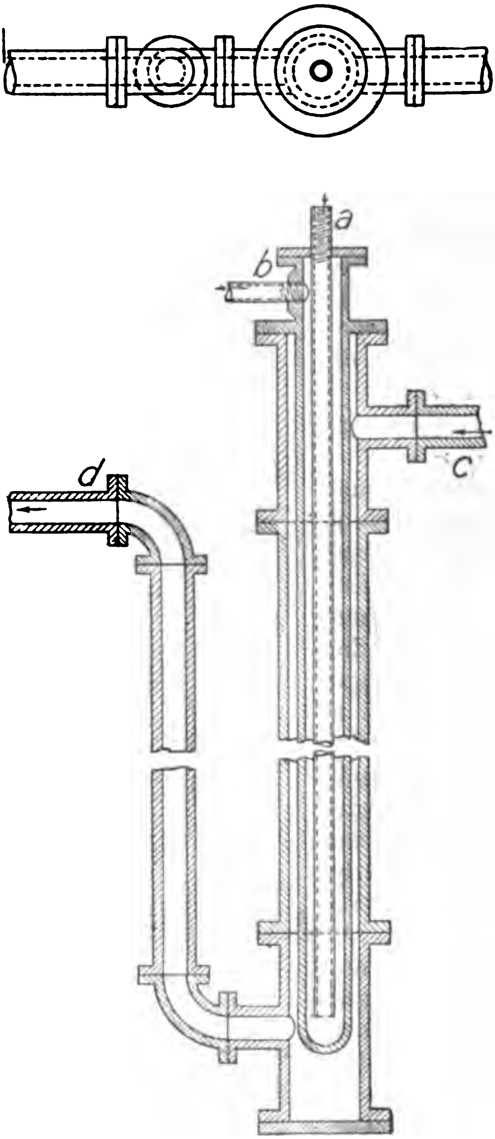


FIGURE 36.—Cooler for acid from oleum towers. *a*, Cooling water inlet, 1-inch standard pipe; *b*, cooling water outlet; *c*, acid inlet; *d*, acid outlet.

APPROXIMATE INSTALLATION AND MANUFACTURING COSTS.

COSTS OF INSTALLATION.

The costs of installing the Grillo-Schroeder, Badische, or Tentelew systems in a fairly large-sized plant (daily capacity 60 tons or more) do not differ widely. On a prewar basis, with costs of material and labor as in about the years 1910–1914, the cost would be approximately $6,000 per ton of H_2SO_4 (100 per cent basis) daily capacity if pyrite burners and complete ore-handling equipment be included.

The substitution of sulphur for pyrite would decrease the installation cost $1,000 to $1,500 per ton of daily capacity.

The cost of materials and labor existing in this country during the war and at the present time are so much higher than in prewar times and vary so widely that a general estimate of present costs of installation is liable to be misleading.

The following estimates per ton of daily-capacity installation cost cover a large plant construction in the United States during the year 1918 and utilizing brimstone as the sole source of SO_2 gases. This plant used a modification of the Grillo-Schroeder system.

Estimated cost of installing a large acid plant in 1918.

General:	Per ton, daily capacity.
Excavation	$40
Miscellaneous	80
Total	120
Buildings:	
Concrete	286
Structural steel	352
Lumber	240
Tile	48
Roofing (all classes)	108
Total	1,154
Equipment:	
Material	3,314
Labor	1,700
Total	6,168
Platinum	1,560
Total	7,728
Overhead, supervision, and indirect expense	600
Grand total	8,328

The estimates for this plant, however, also included several denitrating and heat concentrating towers, very large acid storage tanks, and all accessories. No heat transfers were used.

For a Grillo-Schroeder unit of approximately 20 tons daily capacity, including dust flue, cooling and scrubbing system, box type filters, preheating furnace, contact tubes, gas cooling and absorbing system, oleum system and acid storage, but not including roasting or ore handling installation or buildings, the approximate amount of materials required is as follows:

Materials required for a Grillo-Schroeder unit of 20-ton capacity.

Brick	26,000
Concrete, cubic yards	225
Lead, pounds	82,000
Cast iron, pounds	215,000
Steel, pounds	45,000
Lumber, board feet	45,000

As the size of plant increases up to about 60 tons daily capacity, the ratio of construction materials used to tonnage capacity decreases materially. The amount of buildings necessary depend largely upon the climatic conditions at the plant locality.

The cost of a Mannheim-type plant, with its double oxidation and absorption system, is much higher than that of any of the other three types of plants mentioned.

MANUFACTURING COSTS.

The factory cost of producing sulphuric acid in this country prior to the war in large and well designed plants of the Grillo-Schroeder, Badische, or Tentelew systems, including plant overhead charges, cost of ore roasting and all charges for operation and repairs, labor, and materials, but not including plant amortization or cost of sulphur, varied between $2.50 and $4 per ton of acid (100 per cent H_2SO_4 basis). This range in costs arises from variations in the gases used as to SO_2 strength and dust and fume content; from the complete or partial use of heat transfers for gas preheating, or the absence of such equipment, necessitating preheating by fuel; and lastly, but not least, from intelligence in the design and operation of the plant.

The following estimates of actual cost of operation apply to a plant constructed during 1918.

Estimated cost of operation, per ton of acid.

Coal consumption, tons	0.33
Water consumption, gallons	6,900
Power consumption, horsepower-hours	120
Compressed air, cubic feet	2,000

The number of men required to operate a contact plant is comparatively small. For a plant ranging up to 60 tons in daily capacity one operator per shift with an assistant, who also attends to the preheating fires, is required; also there should be one man on the day shift for changing filters, cleaning dust flues, etc., and one man loading and unloading acid, etc. This, of course, does not include the men required for handling ore and running the roaster. Repairs are light in a well-designed and well-operated plant.

COMPARISON OF COSTS OF MANUFACTURING ACID IN CHAMBER AND IN CONTACT PLANTS.

For high-strength acid, such as is employed in the manufacture of dyes, explosives, and other special chemical industries, the contact process is by far the cheapest and most efficient.

For commercial oil of vitriol (66° B. acid), such as is usually shipped for various manufacturing processes, petroleum refining, and other uses, the contact process (excepting the "Mannheim" process) should produce the cheaper acid.

For low-strength acid, such as is usually employed in the manufacture of fertilizers, the acid itself, based on the cost of producing the SO_3, can be made more cheaply by the contact than by the chamber process, but there are other factors to be considered, chief among them being the storage facilities and the necessity of diluting the acid before using it. Furthermore, the chamber process as practiced at most fertilizer plants, does not require as highly trained and experienced a staff as does a contact plant. With an equally capable and trained staff the costs at some plants would probably show in favor of the contact process, but for the production of low-strength acid for ordinary purposes from pyrite or other ores which may contain impurities, the chamber process is the cheaper.

LEACHING AND SINTERING CALCINED ORE OR PYRITE CINDER.

In the discussion relating to the raw materials used for the manufacture of acid, mention is made of the fact that a large proportion of the Spanish pyrite ore, and also much of the domestic ore from the Southern States, carries copper in proportions that make its recovery worth while. Also, in order to prepare roasted or calcined ore, containing copper for the iron blast furnace, it is necessary to leach out the copper before sintering.

The method utilized to a large extent in the United States for the recovery of copper from calcined ore of low copper content (0.5 to 2½ per cent Cu) is commonly known as the Henderson salt leaching process. This process is ordinarily conducted in several distinct steps, and, while individual methods of carrying out these steps may vary, the steps themselves are practically the same in all practices. These may be characterized as follows: (1) Preparation of the charge, (2) roasting with sodium chloride, (3) leaching the calcine, (4) precipitation of the copper, and (5) disposal or treatment of the leached calcine.

PREPARATION OF THE CHARGE.

The charge usually consists of cold pyrite calcine, usually containing anywhere from 2 to 5 per cent sulphur; rock salt; and raw crushed pyrite. In some plants, however, no raw pyrite is used.

The method of preparing this charge varies considerably with different practices. In some plants the calcine and the rock salt are ground together in special grinders, such as Phillip MacLaren mills equipped with cast-iron slotted grates or screens; the ground product is of such fineness that more than 90 per cent of it will pass through a 10-mesh screen. It is inadvisable to grind too finely, as a certain proportion of coarse material should be present in order to facilitate free percolation of the leaching water in the subsequent treatment.

Other plants do not grind the material so finely. Some of the best plants in this country grind so that all of the material passes a ⅜-inch square mesh and only about 80 per cent of it passes through a 10-mesh screen. Also, the practice of grinding the salt together with the balance of the charge is not followed at all plants, and apparently is not necessary, as complete mixing is obtained on the roaster hearths later on.

The proportions of the various materials in the charge used also varies greatly according to individual practice. Some plants do not use any raw pyrite whatever, but a close study of the results obtained by various plants would seem to show that this practice is not conducive to the best results. If no pyrite is used a much higher temperature in the roaster is required, necessitating the use of a large amount of fuel and also frequently resulting, on account of the high temperature, in the formation of insoluble cuprous chloride. Judging from results, the best practice would seem to indicate the use of about 2½ per cent of sulphur for each 1 per cent of copper present in the charge.

The calcine, raw pyrite, and rock salt are stored in separate bins, and are discharged from the bottom of these bins in carefully regulated proportions onto separate belt conveyors. These conveyors discharge onto a main belt, which therefore carries the finished charge in its correct proportions. As previously stated, in some plants this whole mixture is ground and screened. In other plants the grinding of the materials is done separately and the ground materials run to the bins that feed the individual conveyors. The complete mixed charge is carried by the main conveyor either direct to the feed hoppers above the salt roasters or else to a large storage hopper which supplies the feed hoppers.

ROASTING WITH SODIUM CHLORIDE.

There is considerable difference in opinion as to what reactions take place in the Henderson process. Some authorities maintain that there is a direct reaction between the sodium chloride and the copper salts present in the calcine, by which the copper salts are converted into soluble cupric chloride. However, the fact that a definite amount of sulphur apparently must be present for complete reaction would seem to indicate that nascent hydrochloric acid is formed by the reaction of sulphur dioxide upon the sodium chloride, and that this acid then reacts with the copper salts, forming soluble cupric chloride. Whatever the intermediate reactions may be, plant results indicate that a large proportion of sulphur is needed.

MUFFLE ROASTERS.

In this country the salt roasting is accomplished in several different forms of multiple-hearth roasters. Some plants use muffle roasters, such as the Wedge type. Muffle roasters are usually equipped with two coal furnaces, one on each side of the roaster. The hot furnace gases discharge into a vertical chamber extending the full height of the roaster. The muffles are each divided into two sections; the hot gases from the vertical chamber enter all the muffles in parallel, by means of a separate inlet to each muffle. These inlets are provided with dampers for draft regulation. The gases discharge on the opposite side of a roaster into a stack, also connected with all the muffles in parallel.

The installation described refers only to half of each floor, as there are two muffles on each floor and similar heating equipment is installed on the other side of the furnace and heats the other half of the muffled floors in the same manner.

In order to obtain a greater heat efficiency, frequently a considerable number of bricks are removed from the lower floor of the muffles, thus allowing direct radiation of heat through the holes down onto the charge on the floor below. With a muffle roaster about 19 feet in inside diameter, having five hearths and a top drier hearth, and utilizing the upper four hearths as heating hearths and the bottom hearth as a cooling hearth, the capacity obtained is generally about 75 to 80 tons of dry calcine per day, provided the calcine does not contain more than 2 per cent copper. If the copper content of the calcine reaches 3 per cent, however, the capacity is reduced to about 50 tons daily, as a much longer roasting period is necessary to convert all the copper into soluble form.

When these roasters are operated in this way and no raw pyrite is used in the charge the temperature on the roaster hearth ranges from 750° to 1,100° F., and is preferably maintained around 1,000° to 1,050° F. If the ore temperature rises above 1,100° F., so-called ferrites are formed which are insoluble in water.

With such roasters operating on a charge consisting of about 85 per cent of calcine and 15 per cent of commercial rock salt by weight, and with no raw pyrite added, the fuel consumption, when coal is used, is about 10 per cent of the weight of the total charge put through the furnace.

SINGLE-HEARTH ROASTER.

Another type of roaster utilizing the same charge and the same temperatures is a large, single-hearth roaster equipped with four water-cooled rabble arms and heated by direct firing with fuel oil. This type of roaster consumes 15 to 18 gallons of fuel oil per ton of calcine roasted, and considerable difficulty is encountered from local overheating.

The hot calcine discharged from the roasters is allowed to stand in cans for a period of time limited by the number of cans available. It has been found that permitting the hot calcine to stand in closed cans causes the chloridizing to continue; therefore, if possible, this material is allowed to stand for five hours or more before being dumped into the leaching vats.

The gases from this chloridizing roast are a mixture of combustion gases, hydrochloric acid gas, sulphur dioxide gas, and sulphur trioxide. These hot gases ascend through brick absorption towers countercurrent to a stream of water flowing down over the grill filling. The water is heated practically to boiling point, and the acid constituents of the gases are largely dissolved in the water, with the result that a hot solution of very weak acid is produced. This solution is run to storage and immediately used for leaching copper out of the roasted calcines; it has an acidity of about 0.3 per cent figured as HCl.

RAMEN-BESKOW MULTIPLE-HEARTH ROASTER.

Another method of chloridizing used at one plant in this country differs radically in the roasting equipment, roaster charge, and the way in which the heat is applied from the one just described. This method utilizes a chloridizing roaster known as the "Ramen-Beskow" roaster, which is about 18 feet inside diameter and has five hearths. The top hearth is provided with four arms and the other four hearths are each provided with two arms. The roaster has no steel shell, but is a thick brick setting about 20 feet square on the outside and circular on the inside, strongly reinforced with buck staves. The lower hearth is provided with four flues built into the four corners of the rectangular brick setting. The top hearth of the roaster is direct fired with producer gas from a coal-gas producer, and the products of combustion go to a stack; the heated ore passes through a lute into the second hearth, the gases discharging through the flues mentioned.

The average charge fed to this roaster is as follows: Dried calcine, 83 per cent; salt, 10 per cent; and pyrite, 7 per cent. The proportion of pyrite is varied somewhat from time to time, but the aim is to have at all times 2½ times the sulphur in the mix that there is copper in the calcine. The copper content of the calcine varies considerably, but usually averages about 2½ per cent.

The charge is heated on the top hearth to about 1,000° F., so that when it discharges into the second hearth the oxidation of the pyrite content has started and chloridizing begun. Air for oxidation comes in through the bottom hearth, countercurrent to the descending charge, and ascends over the four lower hearths. The gases resulting from the oxidation—SO_2, HCl, and some SO_3—pass out of the second hearth into the flue in each of the four corners and are drawn downward through these flues by means of a fan and pass through three absorbing towers in series.

The first absorbing tower is 8 feet in inside diameter by 35 feet high. It is filled with tile with a little slag on top. Water flows down this tower countercurrent to the hot ascending gases and absorbs part of their acid content, discharging from the base of this tower as a weak acid with an acidity of 2 to 3½ per cent figured as HCl. The gases then pass through the other two towers in series, but these towers are really scrubbing towers and the water from them is run to waste. The last of these two towers is packed with coarse limestone, which neutralizes any final acidity in the gases.

The average charge run through this roaster amounts to about 45 tons, dry weight, of calcine per 24 hours. About 3,000 pounds of coal per 24 hours is used in the form of producer gas to preheat the charge on the top floor of the roaster.

A concrete hopper bin is installed under the roaster into which the roasted calcine is discharged and in which it is permitted to accumulate for about 10 hours, when it is drawn off into cars and taken up an incline to a trestle, from which it is distributed to the various leaching tanks.

HERRESHOF MULTIPLE-HEARTH ROASTER.

A third method of chloridizing, which is used somewhat extensively in this country, is probably the most economical and efficient of any of the methods in current use.

The average charge run to the roaster is as follows: Salt, 7 per cent; raw pyrite, 3 per cent; and calcine, 90 per cent.

The roasting equipment consists of Herreshof roasters, each roaster being 22 feet in outside diameter and having seven hearths. Those roasters are lined with 4 inches of common brick and 9 inches of fire brick. The capacity of each roaster is about 50 long tons of total charge per day. No fuel is required and no preheating of the charge. The temperatures of the charge descending through the roaster are about as follows: Temperature on the second floor, 300° F.; on the fourth floor, 750° F.; and on the sixth floor, 550° F.

The material tends to cake solidly on the hearths, and the cakes must be barred out occasionally to prevent wearing off or breaking of the rabble teeth, but otherwise the roaster works well. The roasters are arranged in banks of three and are housed in a steel frame building with steel floors, in which ample room is allowed for barring out the roasters and taking care of operation and repairs.

The roasted material is discharged from the roasters into small, 1-ton hoppers, from which it is run into cars operated by a cable system, this system being in use throughout the plant. By means of this system the cars are run up on elevated tracks and dumped into the leaching tanks below.

COMPARISON OF THE DIFFERENT ROASTERS.

In reviewing the three principal methods of salt roasting, as described above, it will be noticed that they vary considerably, especially as regards the amount of salt used, the amount of pyrite used, and the fuel consumption. From practical plant results, it may be stated that by far the best results are obtained where the fuel consumption is either at a minimum or none is used and where the temperature on the roasting hearths is never permitted to exceed 750° to 800° F. There is a slightly added expense due to the increased amount of raw pyrite used, but this is far more than offset by the saving in fuel and in salt. The installation cost is somewhat greater, owing to the smaller capacity of the roasters.

LEACHING.

The hot product from the chloridizing roasters, after standing for a certain time, as previously mentioned, is leached with water that generally contains a small proportion of acid. Leaching is done in large vats or tanks, of which several different types are in use at various plants; also several different modifications are used.

A TYPE OF LEACHING PLANT.

One type of installation used rather extensively, and the details of its operation are as follows:

VATS.

Two types of leaching vats are used. The first and most satisfactory type consists of a double-walled, yellow-pine box about 11 feet square by 5 feet deep, inside dimensions. The outer box is built of 3-inch plain stock, and the inner box is of 3-inch stock with tongue and groove. The two boxes are doweled together with a space of about 3 inches between, which is filled with concrete, mixed in the proportion of 1 part of cement to about 4 of sand. The inner wooden box has no wood bottom; its sides extend to within 4 inches of the bottom of the outer box. The bottom is then covered with 7 inches of concrete, so the wooden sides of the inner box extend about 3 inches down into the concrete. Two tiers of brick grillwork are laid on top of the concrete. The first tier is of bricks, set on end and spaced to carry a second layer of brick laid flatwise. Cracks are left between the bricks in the second layer, and these cracks are filled with "salt hay" (dried salt-marsh grass), and a thin layer of the hay is strewed over the bricks. On top of this hay another layer of bricks is laid flatwise with cracks between, and salt hay is placed in the cracks and a little hay on top. A little cold, wet calcine is thrown on top of the top layer of hay in order to prevent the hot calcine from burning it: about 8 tons of hot calcine is then dumped into each leaching box and leveled off roughly.

The best outlets for the copper liquor are large wooden blocks of yellow pine set into the side of the leaching boxes at the bottom. These blocks project through both the outer and inner boxes and are cemented into place by the concrete filling between the boxes. A hole is bored through this block and a taper wooden plug is used. This type of outlet is simple and lasts for years.

Another type of leaching vat is constructed of reinforced concrete and is about 16 feet square. The vat is fitted with the same type of grillwork as the wooden leaching boxes. This type, however, is not as satisfactory as the far cheaper wooden vat, for two reasons:

1. The concrete vats, although much more expensive to construct, are acted upon by the weak leaching acid and deteriorate rapidly. The steel reinforcing rods are also attacked and the whole installation, as regards economy of operation, has proved a disappointment.
2. For some reason not definitely known, the leaching capacity of the vats does not increase in the same ratio as the increase in size.

COPPER LEACHING PROCEDURE.

The charge of hot calcine is first leached with the second leaching water from a previous charge; this water, of course, already contains some copper. The water for the first leaching is not very warm, but is soon heated by the hot calcine.

The first leaching is permitted to stand for about five hours, when a large part of the copper in the ore is in solution. The plug is then withdrawn from the discharge hole of the vat, the leaching water—now at its highest strength in copper—is filtered off and is run through a series of settling tanks in order to settle out lead salts, etc., after which the liquor is run through the copper precipitating boxes. The strong liquor emerging from the leaching vats will average in gravity 6° to 14° B., and will contain 0.8 to 1 per cent of copper.

After the first leaching water has drained down to the level of the top of the calcine in the leaching vat, hot acidulated water from the roaster-gas absorbing towers is run into the vat at a rate sufficient to keep its level just above the calcine level, while the strong copper liquor is being discharged from the bottom of the leaching vat.

Tests are now made from time to time by sticking a bright steel "knife" down into the leached ore. If any soluble copper remains, the bright steel will immediately be covered with a coating of copper. Leaching with fresh hot acidulated water is continued until the "knife" test shows no soluble copper remaining.

When the leaching liquor being discharged from the bottom of the vat reaches a fairly low concentration in copper it is turned to storage and used for the first leaching of subsequent batches of fresh calcine.

SETTLING OF SOLUTIONS.

The strong liquor from the first leaching of the ore is run through an extensive system of wooden settling tanks, where lead salts and other impurities are precipitated as sludge. These settling systems are in duplicate and one system is drained and the sludge cleaned out while the alternate system is being used.

ANOTHER TYPE OF LEACHING EQUIPMENT.

Another type of copper-leaching equipment and its method of operation may be described as follows:

The leaching tanks used are circular wooden tanks 20 to 25 feet in diameter by 4½ feet deep. These tanks are very heavily banded, the bands being kept away from the wood sides of the tanks themselves by means of 1-inch wooden blocks. The tanks are lined with a 4½-inch lining of "duro" brick, set in "duro" cement. The bottom of the tank is covered with a layer of what might be termed an asphalt mixture with a cement layer on top, the whole resembling bituminous pavement. The object of using the brick lining is to prevent burning of the wooden walls by the hot calcine. The bitumen bottom seems to protect the wooden staves below and to fill any shrinkage cracks caused by the heat of the charge above.

The liquor outlet of these tanks consists of a capped wood block built into the sides of the tank close to the bottom. No grill work of brick or tile is placed in these tanks, but they are filled to a depth of about six inches with chunks of coarse slag. On top of this is put about four inches of slough grass or excelsior, and about six inches of calcine is left on top of this grass or excelsior at all times. This type of filter bottom has proved very satisfactory; the liquor drawn off through it is extremely clear and such a bottom lasts a long time without replacement. In this connection, however, attention is called to the fact—which is brought out later—that an extremely large amount of wash water is required in order to free the calcines from the copper liquors. As this is not the case in other plants where the leaching tanks are smaller and where the more porous and uniform filter bottom is installed, it is extremely likely that uniform percolation is not attained, hence a much larger amount of wash water, or displacement water, is required.

The capacity of the 20-foot diameter tanks is about 45 tons of calcine, and of the 25-foot tanks, about 60 tons. This charge makes a bed with a total thickness of approximately 3½ feet. The total time of leaching for each tank is 24 to 48 hours. The first leaching is with final wash liquor from previous batches of ore. The liquor is cold but is rapidly heated by the hot calcine to nearly boiling temperature.

The liquor from the first leaching usually averages 3 to 3½ per cent copper, but so much water is required to remove all the soluble copper that the average copper content of the liquors sent to the precipitating tanks is not more than 1½ per cent. The amount of wash water varies greatly. It is probable that complete recovery of the soluble copper with the use of far less wash liquors could be accomplished by paying specific attention to three points:

1. The depth of ore bed is too great for maintaining uniform consistence throughout, and as a result the displacement of the heavy copper liquors downward by the lighter wash liquors will not be uniform, but will be governed largely by the density of the charge at individual places in the tank. Almost identical conditions are met with in the displacement of the acid from guncotton after nitration; in the Thompson displacement system, it has been definitely proven that such displacement with a sharp break between the heavier liquors below and the light liquors above can not be maintained beyond a certain well-defined depth of charge. The same thing has also been definitely proven in the displacement of cyanide liquors in current Western practice.

2. The size of the tank undoubtedly also governs the uniformity of displacement over any given cross section. This also has been demonstrated in acid displacement from guncotton, and has likewise been observed in other plants utilizing the Henderson process for copper leaching. Operators of these plants have discovered that with a smaller tank they can accomplish complete displacement of the copper liquors with the use of far less wash water.

3. The manner of adding the wash water has undoubtedly a decided effect upon the amount required for complete washing. If the original liquors be allowed to sink below the surface of the ore before the wash water is applied, cracks will develop in the ore and channeling will take place with any subsequent wash water added. When the main liquors have reached practically the top of the ore the wash water should be floated on quietly, and great care should be taken that it does not agitate the heavy liquors below, nor stir the ore. Otherwise mixing is bound to occur, and the washing resolves itself into simply a dilution process.

The concentrated copper solution is run through large wooden storage tanks and the weaker wash liquors are run to other wooden storage tanks, and, as previously stated, are reused for the first leaching of new batches of ore.

The tanks are allowed to drain until no more liquor will run off, then the leached calcine is transferred from the tanks by means of a locomotive crane with a clam-shell bucket, into gondola cars and transported to a bin from which it goes to the sintering plant.

A THIRD TYPE OF LEACHING EQUIPMENT.

Still another leaching outfit, which has given good results, and the method of operating it are as follows:

The leaching tanks are circular, 25 feet in diameter by 5 feet deep. These tanks are arranged in two parallel rows, each tank being elevated about 8 or 10 feet above ground level. The tanks are not brick lined, as the leaching water is put in first and the hot, roasted calcine dumped into the water, this procedure doing away with any chance of burning the wooden walls. The first layer of the filter bottom is 2-inch by 4-inch grillwork; on top of this, 4-inch by 4-inch timbers are laid parallel to each other and on their corners and are spaced about one-fourth to three-eighths of an inch apart in the clear. The corrugations formed by these timbers are filled with coke. A layer of anthracite culm is spread over the top and shoveled off each time with the leached calcine. As this culm can be used for fuel in sintering there is no loss in this procedure, and a fresh, open filtering medium is obtained with each new tank charge of calcine by this method of operation. In the bottom of each tank there are four square openings, through which the ore, after leaching, is shoveled into cars on tracks below. These openings are closed by beveled wooden plugs. The four openings are at the four corners of a square and are placed symmetrically in the rows of tanks so that all the openings come directly over the tracks below. Two tracks run under each tank, and are equipped with the Hunt cable system, by means of which, also, the leached material is transported to the sintering machine storage.

The capacity of each tank is 125 long tons of material.

The material is given three leachings. The first leaching is with the liquor from the second leaching of the previous charge. This liquor already averages about 1 per cent copper, and after the charge is leached will contain 2½ to 3 per cent copper, at which strength it is drawn off and sent to the precipitating tanks. The second leaching is with liquor from the third leaching of the previous charge. This liquor averages about 0.2 per cent copper to start with, the copper content being increased to about 1 per cent by the second leaching of the calcine. The charge is leached a third time with water which, as stated above, analyzes about 0.2 per cent copper after the third leaching is finished. Ample storage for all these various strengths of leaching liquors is provided.

As previously stated, the liquor for the first leaching is drawn into the leaching tank in correct amounts and the roasted calcine is dumped into the liquor; thus removing the necessity for brick or other lining of the tanks to prevent injury from the hot calcine. The charge fills the tanks to within 6 or 8 inches of the top.

All transferring of the leaching liquors is performed by means of sump tanks and air lifts.

COPPER PRECIPITATION.

The precipitation of the copper from the solutions is done entirely by means of scrap iron. Electrolytic precipitation of such solutions is interfered with seriously by the presence of sodium sulphate, chlorides, and other salts in solution and is commercially impracticable. Various types of precipitating tanks or vats are used, according to the individual ideas of different designers.

One type of tank is constructed exactly similar to the double-wall concrete-lined tank, previously described as being used in certain plants for the leaching of the calcine, with the exception that it has no brick grill, but a grill work of wooden ties spaced several inches apart and supported on two ties laid on opposite sides of the bottom of the box. The scrap iron is placed on top of this wooden grill. After copper deposition has taken place for some time the scrap iron is shaken by hand, which causes the copper cement to fall off and drop down between the grills into the space below. Any type of old iron is used, but old galvanized iron is preferred, as it is not so badly rusted. The actual consumption of iron is about 110 pounds of scrap to 100 pounds of copper. The copper cement will average about 80 per cent copper.

Another type of precipitation apparatus which is widely used is large circular wooden tanks, each tank being about 22 feet in diameter by 5 feet deep and having no grill work at the bottom. These tanks are filled with scrap iron and are then run full of concentrated copper solution from the leaching tanks. The solution is agitated with air from time to time, also the scrap iron is picked up and shaken with the clamshell bucket of a locomotive crane at frequent intervals to free the adhering copper cement from the scrap iron. This is done until the liquor in the tank shows no more copper content, then the liquor is allowed to drain off through a filter and a fresh charge of liquor is added. The same procedure is followed with this charge of liquor and each succeeding charge until the depth of copper cement in the tank is about 18 inches. The residual scrap iron is then transferred by means of the crane to an adjacent tank. The copper cement is then dug out of the tank by hand and is screened through a heavy screen of about one-fourth inch mesh. All the fine copper cement that passes through the screen is then run down into blister copper in a small reverberatory furnace; the rejects on top of the screen are put back into another precipitation tank, as these rejects consist largely of iron. The copper content of the cement averages about 85 per cent, and after treatment in the reverberatory furnace about 98 per cent.

Still a third type of tank, which has been successfully used, is a simple circular wooden tank about 12 feet 6 inches in diameter by 4½ feet deep. No agitation is used in these tanks, but the contents are warmed at first with steam. About 10 to 14 hours are usually required for the complete precipitation of a tank full of strong solution. The copper cement is shoveled out and transferred in wheelbarrows or buggies to screens where all large particles, iron and steel scraps, etc., are screened out. The screened cement will run about 70 per cent copper.

DISPOSAL OR TREATMENT OF LEACHED CALCINE.

With the exception of a small amount of extremely pure leached iron pyrites, known as "blue billy," which is used as a pigment in metallic plants, all of the material after leaching is either nodulized or sintered and sold as iron ore to blast furnaces.

NODULIZING EQUIPMENT AND METHOD OF OPERATION.

In the nodulizing of calcine an ordinary rotary cement kiln is used, generally about 7 to 9 feet inside diameter and 100 to 125 feet long. This kiln is set at the usual angle of an ordinary cement kiln and it is generally fired with powdered coal; the amount used varies usually between 14 and 15 per cent of the weight of the nodulized calcine output. The coal used is special gas coal, which generally runs about 35 per cent volatile matter, 51 per cent fixed carbon or higher, and the balance ash.

Some plants experience much trouble with the formation of "rings" in the kilns, whereas other plants operating on the same type of calcine have no trouble whatever. Careful investigation would seem to indicate that this trouble is caused by running at too high a temperature, and apparently the margin of safety between the temperature sufficient for correct nodulizing and the temperature at which serious "ring" formations will take place, is very small. A temperature in the combustion end of the kiln of around 2,000° F. will result in a good product of nodulized calcine and no "ring" formation, whereas a temperature of 2,200° F. results in serious "ring" formation, using the same calcine. This definite temperature would undoubtedly vary with different grades of calcine.

The hot nodulized calcine discharged from the kiln is sometimes permitted to drop into a pit where it is sprinkled with water, after which it is raised into storage bins by means of chain and bucket elevators. A possibly better form of disposal, however, consists of discharging the hot nodulized calcine into a chute, which in turn discharges into a cooling cylinder. This cylinder is 5 feet inside diameter and 60 feet long, and has a steel shell lined with flat segments of cast iron, which protects the steel shell from wear and can be easily renewed. The cylinder rotates in the same manner as does the kiln. The incoming hot nodulized calcine is partly cooled by spraying with water, and the cooling is completed by radiation through the walls of the cylinder and by evaporation as the material moves through it. Just enough water is added so that it will evaporate completely before the material is finally discharged.

The capacity of a nodulizing kiln 7 feet inside diameter by 100 feet long is about 150 tons of finished material a day, and of one 9 feet in diameter by 125 feet long, about 200 tons.

Some companies do not screen the fines from the nodulized product, as no objection to fines is raised by the blast furnaces that utilize the product, whereas other companies do and return the fines for renodulizing to the upper end of the kiln.

SINTERING EQUIPMENT AND METHOD OF OPERATION.

The sintering of leached calcine in order to produce a material suitable for use in iron blast furnaces is generally done by means of a Dwight-Lloyd type of sintering machine. These machines are usually constructed much heavier than those used for other metallurgical materials. A detailed description of their construction and operation is not necessary here.

The sintered material discharged from the machine is run over a grizzly and the fines are returned to a hopper and fed onto the sintering-machine pallets immediately in front of the calcine charge. This results in the pallet being covered with a thin layer of fairly coarse material which keeps the pallet from plugging and greatly increases the efficiency of the machine. This layer agglomerates easily with the charge above it, and does not have to be heated to as high a temperature as is required for sintering the main part of the charge. Thus the pallets are protected from overheating to a considerable extent.

The sintered material is usually discharged, after screening, directly into concrete or brick lined steel cars and drowned in these cars with an excess of water.

The fuel consumption, calculated as carbon, usually is anywhere from 7 to 10 per cent of the weight of the calcine; the fuel used is either finely crushed coke or anthracite coal. In addition, 0.5 to 1 gallon of fuel oil, or a corresponding amount of gas, is generally used per ton of sinter for ignition of the charge.

The weight of the finished product is, as a rule, approximately 90 per cent of the dry weight of the calcines treated.

The requirements of the product for use in the iron blast furnace are a minimum of fine material, absence of vitrification, and the existence of a porous condition described as "cellular," which permits the furnace gases to permeate throughout the material.

Under normal 1913 price conditions, a complete Dwight-Lloyd plant of one standard machine would cost about $20,000 and a complete plant of two standard machines about $30,000. The capacity of each machine is about 150 tons per day.

PRESENT INSTALLATION COSTS.

The actual cost of erecting a leaching plant varies greatly, depending on plant design, climatic conditions at the plant locality, size of plant, and other factors.

Based on construction costs as of 1917–18, it may be stated that a complete plant, including a sintering installation having a daily capacity of 300 to 400 tons, will cost approximately $2,500 per ton of calcine daily capacity. This cost would be divided approximately as follows:

Storage, crushing, drying, screening, mixing, tracks and transport facilities	$400
Roasting	1,150
Leaching	400
Precipitating (on basis of 2½ per cent metallic copper in calcine)	200
Sintering	350
Total	2,500

In a smaller plant—say of 50 tons daily capacity—the unit installation cost is considerably greater and for the same conditions as above would be about $3,200 per ton of daily capacity.

If a nodulizing machine is used instead of a sintering machine, the cost of such nodulizing installation complete will be about $600 per long ton of leached calcine in daily capacity; but it should be borne in mind that a nodulizing installation can not be economically operated on a capacity of less than 125 long tons of leached calcine a day.

The operating costs vary greatly according to different methods of operation, varying capacities, local costs of labor, fuel, etc.

In a large plant having a daily capacity of 250 to 500 short tons of calcine, the costs under conditions as of 1917–18 are approximately as follows:

Treatment of calcine (not including nodulizing or sintering), $5.00 to $8.90 per short ton of calcine.

Sintering, $1.80 to $3.60 per short ton of sintered material.

Nodulizing, $1.40 to $1.85 per short ton of nodulized material.

These costs include all charges for operation and repairs, plant amortization, taxes, and all company overhead and administration charges, also freight on incoming materials and sales costs.

USE OF NITER CAKE.

Niter cake is an impure acid sulphate or bisulphate of soda carrying a variable excess of sodium sulphate, or infrequently, of sulphuric acid from "niter pots" improperly charged or prematurely drawn. Pure sodium bisulphate ($NaHSO_4$) contains the chemical equivalent of 40.6 per cent sulphuric acid with 59.4 per cent sodium sulphate. Niter cake may occasionally have approximately the same composition as sodium bisulphate, but its acidity usually ranges between 28 and 44 per cent sulphuric acid. In addition, the cake contains small percentages of iron, aluminum, and silica as regular impurities, with arsenic, sodium nitrate, or nitric acid as accidental impurities.

The following is a typical analysis of niter cake:

Typical analysis of niter cake.

	Per cent.
Silica	0.70
Oxides of iron and aluminum	.45
Free acidity	34.55
Sodium nitrate	.05
Sodium sulphate	64.25

In solution, niter cake breaks up into sodium sulphate and free sulphuric acid entirely available as such. Thus, 1 pound of niter cake with a free acidity of 34.55 per cent is equivalent to 0.44 pound of 60° B. sulphuric acid.

Niter cake is very deliquescent and if left in the open is gradually washed away and is wasted. The shipping of niter cake is rather a difficult problem, as the acid in the material corrodes bolts, nuts, and rods in the car bottoms, and the drip from the deliquescent cake attacks the springs and trucks.

The following is a list of manufacturing processes in which niter cake is being used or has been used successfully: Pickling iron or steel for galvanizing and tin plating, manufacture of hydrochloric acid, recovery of grease from wool suds and sewage, recovery of glycerin from soap lyes, precipitation of synthetic phenol, manufacture of epsom salts, regeneration of rubber, scouring in the process of calico bleaching, manufacture of carbon dioxide for mineral waters, and manufacture of glue and manure from leather scrap.

Experiment has shown that it is practicable to manufacture both superphosphate and sulphate of ammonia with niter cake, which use may greatly extend the consumption of niter cake in this country. At the present time the principal uses for niter cake are in the manufacture of hydrochloric acid and in pickling iron and steel.

Cleaning iron and steel with niter cake does not differ essentially from pickling with acid, but it introduces certain necessary manipulations due to the presence of sodium sulphate in large proportions as a diluent. Also, as a result of the inhibiting action of the sodium sulphate, it is necessary to allow a longer period to get the same results as when using acid. The usual procedure is to use part niter cake and part acid.

The manufacture of hydrochloric acid for metallurgical purposes is usually carried out on hearths on which sodium chloride mixed with ground niter cake is roasted under conditions that yield hydrochloric acid and neutral sodium sulphate.

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PUBLICATIONS THAT MAY BE OBTAINED ONLY THROUGH THE SUPERINTENDENT OF DOCUMENTS.

BULLETIN 47. Notes on mineral wastes, by C. L. Parsons. 1912. 44 pp. 5 cents.

BULLETIN 98. Report of the Selby Smelter Commission, by J. A. Holmes, E. C. Franklin, and R. A. Gould, with reports by associates on the commissioners' staff. 1915. 525 pp., 41 pls., 14 figs. $1.25.

TECHNICAL PAPER 26. Methods for the determination of the sulphur content of fuels, especially petroleum products, by I. C. Allen and I. W. Robertson, 1912. 13 pp. 5 cents.

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